

**INSTRUCTION MANUAL
AND PARTS CATALOG**

FOR



ELECTRIC GENERATING PLANTS

**MTK
SERIES**

**PARTS AVAILABILITY
NO LONGER GUARANTEED**

ONAN

1400 73RD AVENUE N.E. • MINNEAPOLIS, MINNESOTA 55432
A DIVISION OF ONAN CORPORATION

Important Safety Precautions

Read and observe these safety precautions when using or working on electric generators, engines and related equipment. Also read and follow the literature provided with the equipment.

Proper operation and maintenance are critical to performance and safety. Electricity, fuel, exhaust, moving parts and batteries present hazards that can cause severe personal injury or death.

FUEL, ENGINE OIL, AND FUMES ARE FLAMMABLE AND TOXIC

Fire, explosion, and personal injury can result from improper practices.

- Used engine oil, and benzene and lead, found in some gasoline, have been identified by government agencies as causing cancer or reproductive toxicity. When checking, draining or adding fuel or oil, do not ingest, breathe the fumes, or contact gasoline or used oil.
- Do not fill tanks with engine running. Do not smoke around the area. Wipe up oil or fuel spills. Do not leave rags in engine compartment or on equipment. Keep this and surrounding area clean.
- Inspect fuel system before each operation and periodically while running.
- Equip fuel supply with a positive fuel shutoff.
- Do not store or transport equipment with fuel in tank.
- Keep an ABC-rated fire extinguisher available near equipment and adjacent areas for use on all types of fires except alcohol.
- Unless provided with equipment or noted otherwise in installation manual, fuel lines must be copper or steel, secured, free of leaks and separated or shielded from electrical wiring.
- Use approved, non-conductive flexible fuel hose for fuel connections. Do not use copper tubing as a flexible connection. It will work-harden and break.

EXHAUST GAS IS DEADLY

- Engine exhaust contains carbon monoxide (CO), an odorless, invisible, poisonous gas. Learn the symptoms of CO poisoning.
- Never sleep in a vessel, vehicle, or room with a genset or engine running unless the area is equipped with an operating CO detector with an audible alarm.
- Each time the engine or genset is started, or at least every day, thoroughly inspect the exhaust system. Shut down the unit and repair leaks immediately.

- Warning: Engine exhaust is known to the State of California to cause cancer, birth defects and other reproductive harm.

Make sure exhaust is properly ventilated.

- Vessel bilge must have an operating power exhaust.
- Vehicle exhaust system must extend beyond vehicle perimeter and not near windows, doors or vents.
- Do not use engine or genset cooling air to heat an area.
- Do not operate engine/genset in enclosed area without ample fresh air ventilation.
- Expel exhaust away from enclosed, sheltered, or occupied areas.
- Make sure exhaust system components are securely fastened and not warped.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not remove any guards or covers with the equipment running.
- Keep hands, clothing, hair, and jewelry away from moving parts.
- Before performing any maintenance, disconnect battery (negative [-] cable first) to prevent accidental starting.
- Make sure fasteners and joints are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- If adjustments must be made while equipment is running, use extreme caution around hot manifolds and moving parts, etc. Wear safety glasses and protective clothing.

BATTERY GAS IS EXPLOSIVE

- Wear safety glasses and do not smoke while servicing batteries.
- Always disconnect battery negative (-) lead first and reconnect it last. Make sure you connect battery correctly. A direct short across battery terminals can cause an explosion. Do not smoke while servicing batteries. Hydrogen gas given off during charging is explosive.
- Do not disconnect or connect battery cables if fuel vapors are present. Ventilate the area thoroughly.

DO NOT OPERATE IN FLAMMABLE AND EXPLOSIVE ENVIRONMENTS

Flammable vapor can be ignited by equipment operation or cause a diesel engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. **Do not operate diesel equipment where a flammable vapor environment can be created by fuel spill, leak, etc., unless equipped with an automatic safety device to block the air intake and stop the engine.**

HOT COOLANT CAN CAUSE SEVERE PERSONAL INJURY

- Hot coolant is under pressure. Do not loosen the coolant pressure cap while the engine is hot. Let the engine cool before opening the pressure cap.

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not service control panel or engine with unit running. High voltages are present. Work that must be done while unit is running should be done only by qualified service personnel.
- Do not connect the generator set to the public utility or to any other electrical power system. Electrocution can occur at a remote site where line or equipment repairs are being made. An approved transfer switch must be used if more than one power source is connected.
- Disconnect starting battery (negative [-] cable first) before removing protective shields or touching electrical equipment. Use insulative mats placed on dry wood platforms. Do not wear jewelry, damp clothing or allow skin surface to be damp when handling electrical equipment.
- Use insulated tools. Do not tamper with interlocks.
- Follow all applicable state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- With transfer switches, keep cabinet closed and locked. Only authorized personnel should have cabinet or operational keys. Due to serious shock hazard from high voltages within cabinet, all service and adjustments must be performed by an electrician or authorized service representative.

If the cabinet must be opened for any reason:

1. Move genset operation switch or Stop/Auto/Handcrank switch (whichever applies) to Stop.
2. Disconnect genset batteries (negative [-] lead first).
3. Remove AC power to automatic transfer switch. If instructions require otherwise, use extreme caution due to shock hazard.

MEDIUM VOLTAGE GENERATOR SETS (601V TO 15kV)

- Medium voltage acts differently than low voltage. Special equipment and training are required to work on or around medium voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures will result in severe personal injury or death.
- Do not work on energized equipment. Unauthorized personnel must not be permitted near energized equipment. Induced voltage remains even after equipment is disconnected from the power source. Plan maintenance with authorized personnel so equipment can be de-energized and safely grounded.

GENERAL SAFETY PRECAUTIONS

- Do not work on equipment when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.
- Never step on equipment (as when entering or leaving the engine compartment). It can stress and break unit components, possibly resulting in dangerous operating conditions from leaking fuel, leaking exhaust fumes, etc.
- Keep equipment and area clean. Oil, grease, dirt, or stowed gear can cause fire or damage equipment by restricting airflow.
- Equipment owners and operators are solely responsible for operating equipment safely. Contact your authorized Onan/Cummins dealer or distributor for more information.

KEEP THIS DOCUMENT NEAR EQUIPMENT FOR EASY REFERENCE.

This Manual pertains to the Installation and Part List only. For Operation, Service Diagnosis, and Maintenance and Repair refer to the Instruction Manual.

PLANT DATA TABLE

PLANT MODEL	TYPE PLANT	TYPE START	WATTS	VOLTS	TYPE IGNITION
3MTK-1R/	AC	ELECTRIC	3,000	115	BATTERY
3MTK-1R4/	DUAL PURPOSE	ELECTRIC	3,000	115AC 32DC	MAGNETO
305MTK-232E/	BATTERY CHARGER	ELECTRIC	3,500	32-40	BATTERY
305MTK-115R/	DIRECT SERVICE	ELECTRIC	3,500	115DC	MAGNETO

Order only parts that have a quantity shown under "Parts Reference Letter" that applies to your plant. These letters are listed under "Quantity Used" in the parts list. "Parts Reference Letters" are given on page 27.

GENERAL. - Due to the great variation in the design of hulls and the varied location of compartments suitable for the installation of an electric generating plant, the instructions given here must necessarily be of a general nature. However, the basic principles outlined in these instructions should be complied with. The proper installation of the plant is absolutely necessary for safe, satisfactory and continuous service.

LOCATION. - The plant shall be mounted in a dry, accessible and properly ventilated location. Locate the plant as high as practicable to avoid damage by splash from the bilge or by coming in contact with low lying vapors. The plant should never be located in low pocketed positions.

The plant should be secured to a strong support, preferably centered as near as possible to the boat's main keel. Maintain reasonable accessibility for minor servicing operations and draining of the crankcase lubricating oil.

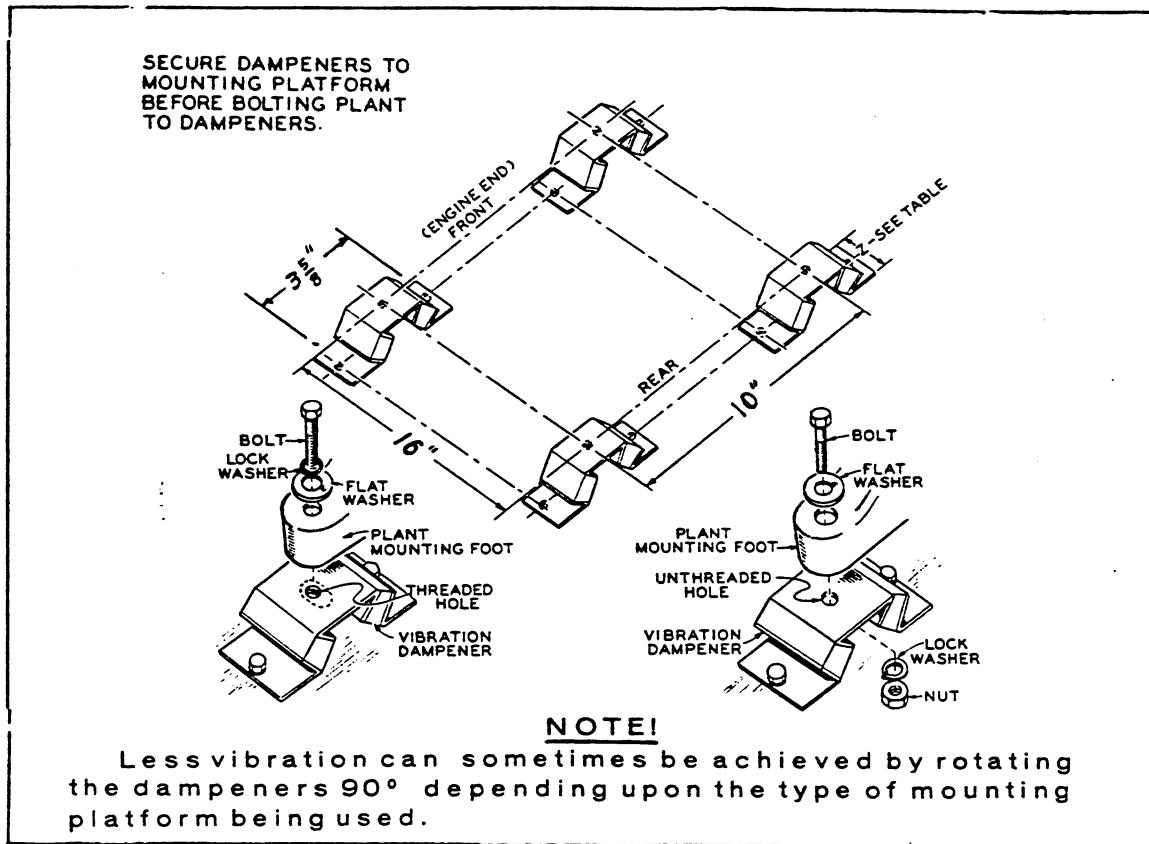
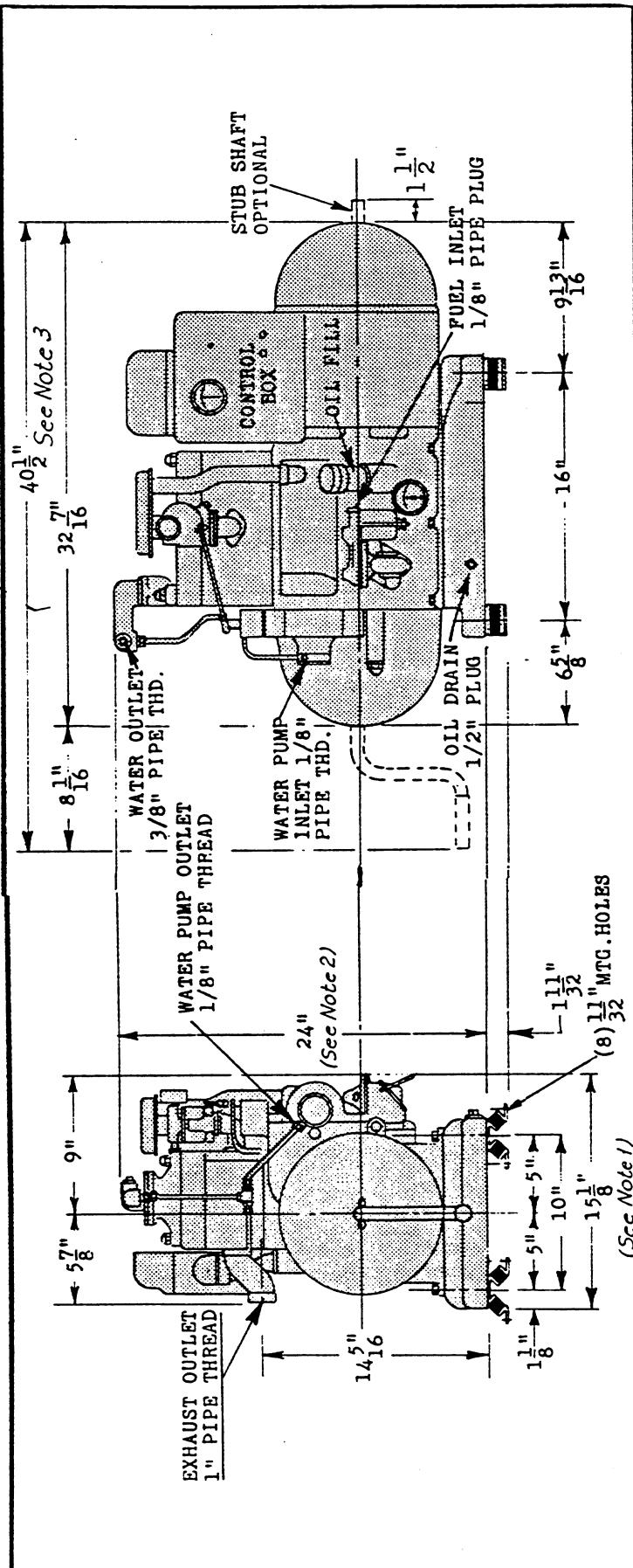


FIG. 1 - INSTALLING VIBRATION DAMPENERS

VENTILATION. - An internal combustion engine must have a free circulation of air while operating. The location should be such that there will be proper ventilation for exhausting of any gases. Any compartment or space in which an engine is located, particularly if it is in the lower portion of the hull or bilge, should be provided with



NOTE—DIMENSIONS FOR ALL PLANTS ARE THE SAME EXCEPT AS INDICATED IN NOTES BELOW—

NOTE I - THIS DIMENSION IS 17 $\frac{1}{2}$ " FOR PLANTS EQUIPPED WITH GEAR TYPE WATER PUMPS.

NOTE 2-THIS DIMENSION IS 25" FOR PLANTS WITH
THE IGNITION COIL BOX MOUNTED ON THE
CYLINDER BLOCK.

NOTE 3-THIS DIMENSION IS 43 $\frac{15}{16}$ " FOR BATTERY CHARGING PLANTS.

FIG. 2 - DIMENSIONAL OUTLINE

means for ventilation to effectively remove any possible accumulation of inflammable or explosive vapors. Fuel tank compartments should be similarly ventilated. It will be found that most craft have provisions for adequately disposing of fuel vapors out of the engine compartment and bilge and can also accomodate the exhausting of any additional vapors emanating from the electric generating plant. If they do not have such provision, the following is recommended.

1. Where the generating plant or fuel tanks are located in closed compartments, permanently open and adequate inlet and outlet ventilating ducts extending to the bilges should be installed; two inlets leading to the wings at one end of the compartment and two outlets from the wings at the opposite end.
2. Where the plant or fuel tank is not located in a closed compartment, at least one such duct should be installed in the fore part of the boat and one in the aft part.

Inlet ducts should be provided with cowls or equivalent fittings. Where feasible, it is also recommended that the outlet ducts be fitted with wind actuated, self turning or rotary exhauster heads, or that power operated exhausters be installed in each outlet duct. If power operated exhausters are used, motors should be installed outside of the ducts and as high above the accomodation flooring as practicable. Such exhausters should be run for at least 5 minutes before starting any engine.

Size of vents should be about proportional to the beam of the boat with two square inches of aggregate vent area per foot of beam as a minimum.

EXHAUST PIPE AND MUFFLER. - The installation of the exhaust pipe and water-cooled muffler must necessarily be governed by the location of the generating plant but there are some requirements that must be met. Install a completely separate exhaust line. Do not connect to any other engine exhaust line.

All of the engine cooling water should be discharged through the exhaust line and enter at a point as near the engine manifold as practicable. Where the first twelve diameters or more of the exhaust are neither jacketed nor cooled by the entire discharge of the engine circulating water, woodwork within 6 inches of any part of the exhaust shall be protected by 1/8 inch asbestos board covered with sheet metal. A dead air space of 1/4 inch shall be left between the protecting asbestos and the wood and a clearance of not less than 1/2 its diameter shall be maintained between the exhaust line and the surface of such protection.

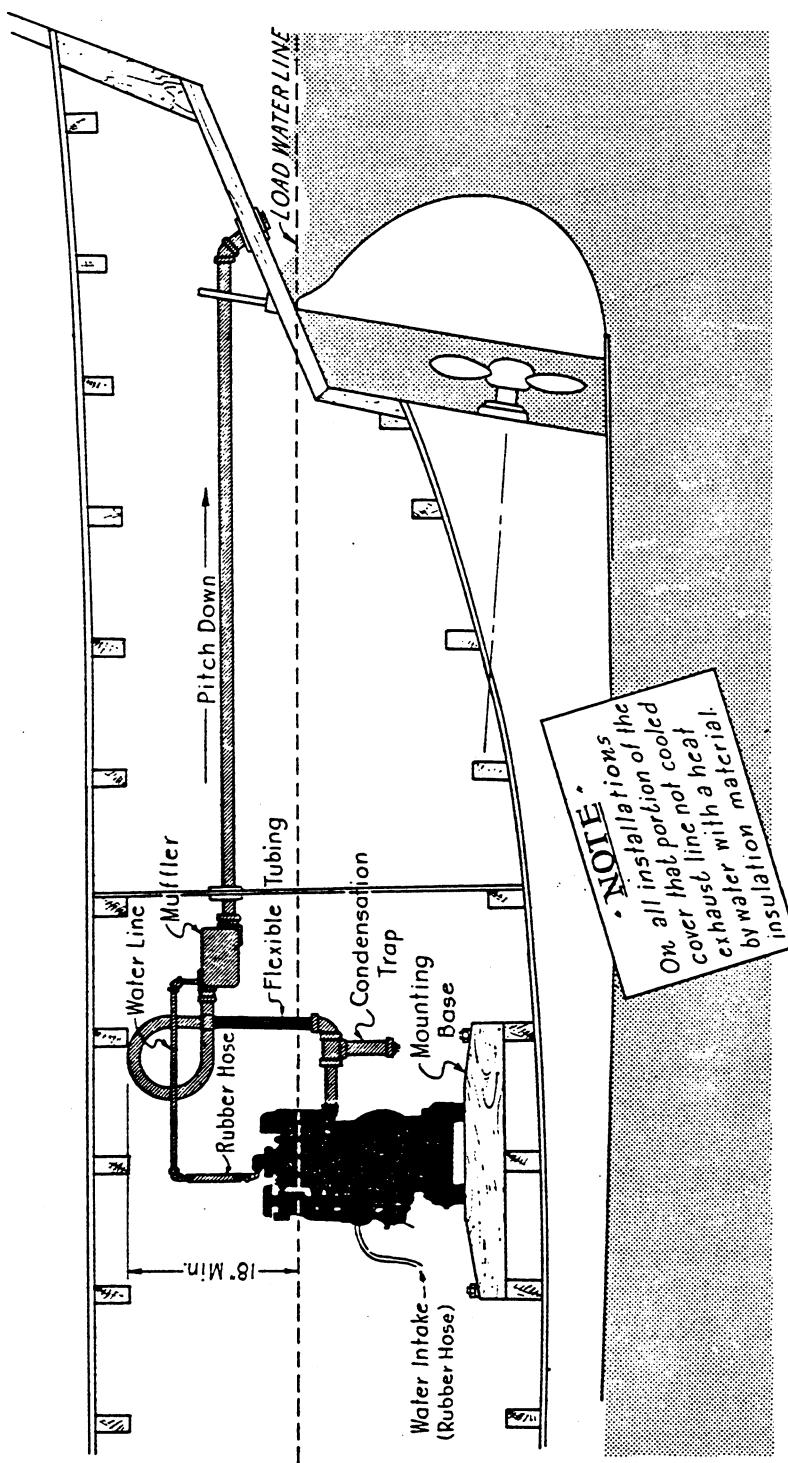


FIG. 3 - TYPICAL INSTALLATION: BELOW LOAD LINE

The portion of the exhaust line not cooled by water shall be covered with insulating material. Where the exhaust line passes through watertight bulkheads, non-combustible packing should be installed. The exhaust line should be led to the point of escape through the hull with a minimum number of bends or elbows.

Where the exhaust outlet is higher than the engine manifold, a condensation trap must be installed in the exhaust line as close to the engine manifold as possible. This applies even though no cooling water is introduced into the exhaust line. One of the products of combustion is H₂O (water) which must be kept from running back to the engine valves. This trap must be fitted with a valve or removable plug to permit draining the trap periodically.

A section of radiator hose at least 10 inches long should be placed in the exhaust line between the engine manifold, or condensation trap if used, and that portion of the exhaust system that is solidly mounted. It must be placed after the cooling water enters the exhaust system. This flexible section should be accessible at all times.

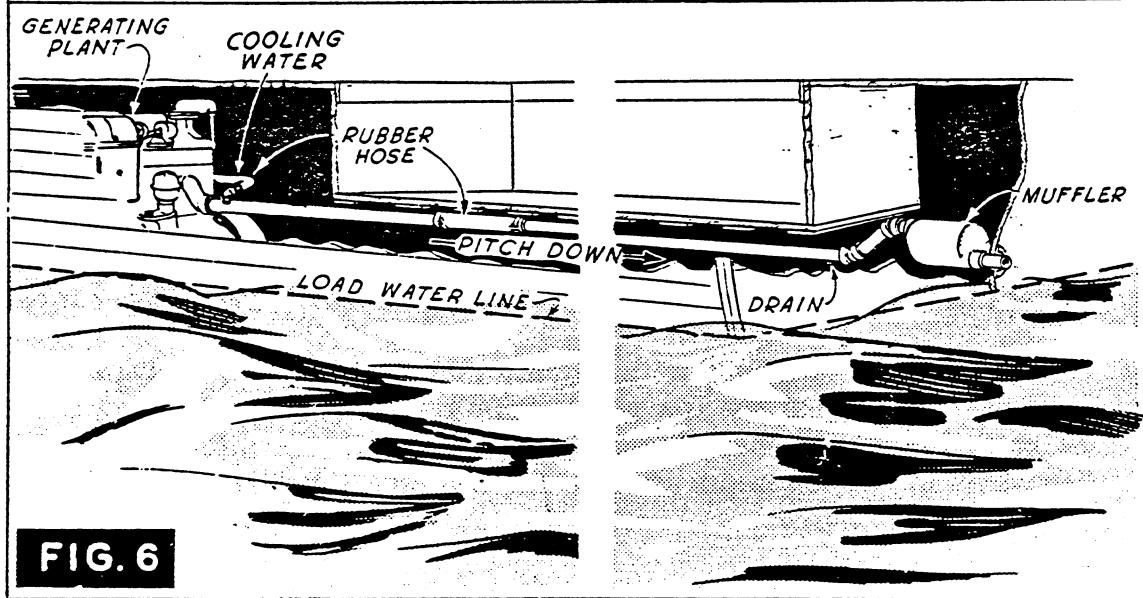
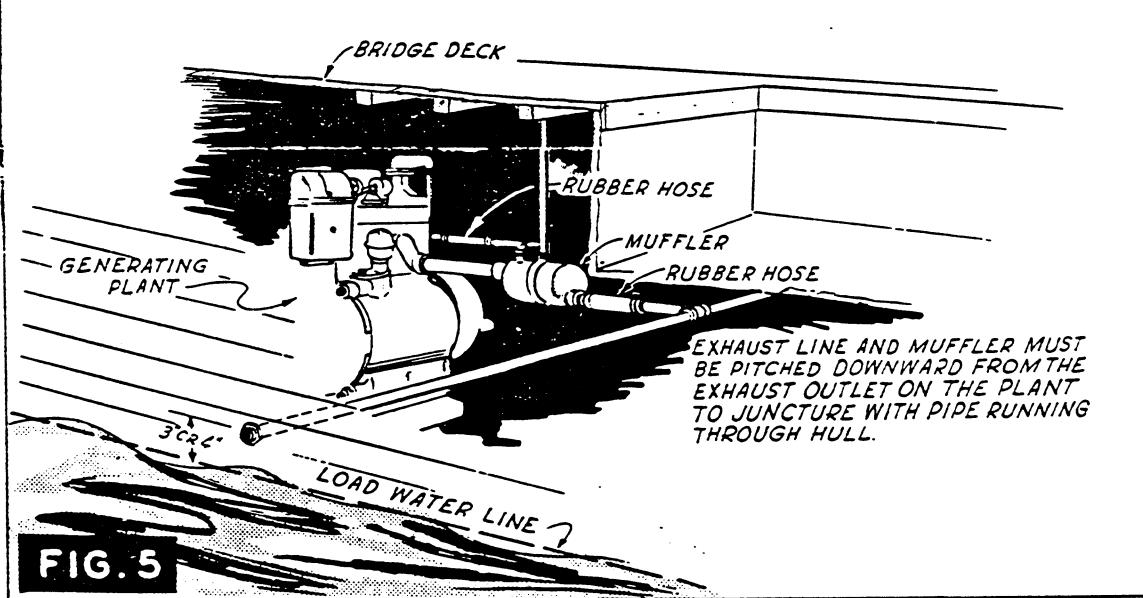
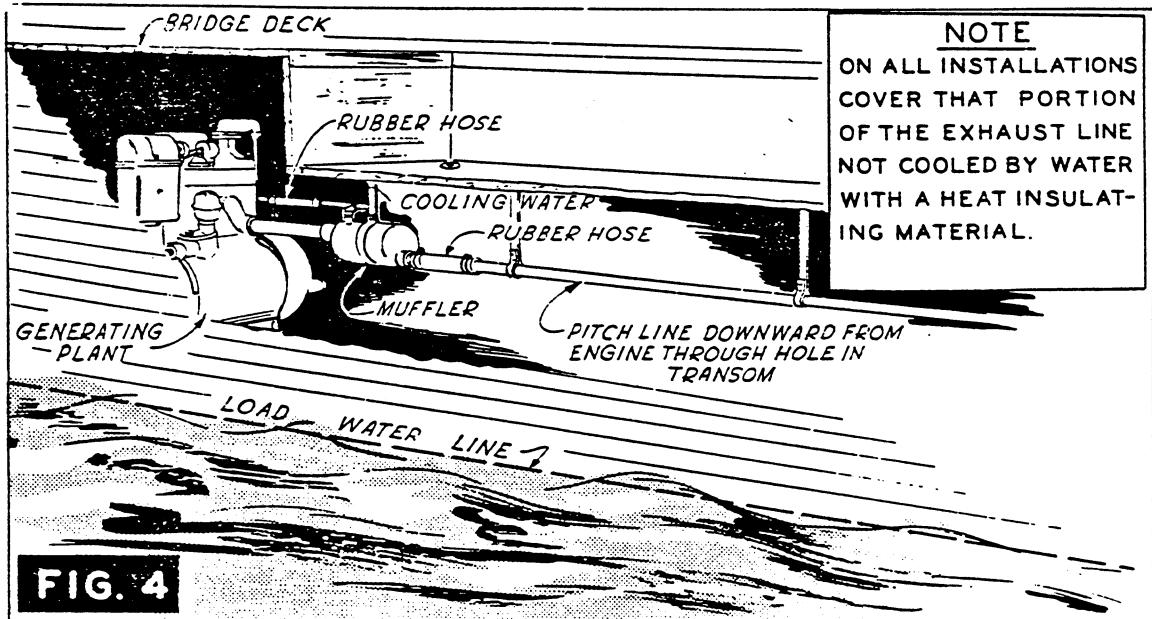
NOTE

When making an installation of the type shown in Fig. 3, an all metal construction tubing should be used ahead of the point where cooling water enters the exhaust system. This type of tubing can be secured from Eclipse-Pioneer Co., Teterboro, New Jersey under part number HD1182.

The inlet and outlet to the muffler are offset from the center. The muffler must be installed in the exhaust line with the outlet at the bottom. This offset allows the muffler to drain itself of cooling water provided it is installed level or with the outlet end of the muffler lower than the inlet end.

With the outlet end of the muffler down, the muffler may be mounted with a downward pitch of up to 60°. In many installations the exhaust line cannot be made to slope gradually all the way to the outlet through the hull, the construction of the boat usually requiring a dip in the exhaust line which causes a low point. This will cause no trouble provided the rise in the exhaust line beyond the low point is not excessive.

The muffler is provided with a drain connection on the bottom so that it may be installed at the low point, thus permitting the exhaust system to be drained to prevent freezing in cold weather. If the muffler is not installed at the low point in the exhaust line, install a drain plug in the line at this point.



TYPICAL INSTALLATION: ABOVE LOAD LINE

If the generating plant is located well above the load water line and there is no possibility that the boat will list enough to ship water into the exhaust pipe, the water-cooled muffler may be placed practically anywhere in the exhaust line that is convenient, provided that the muffler is not installed closer than 8 inches from the nearest engine valve and is slightly below the outlet level of the exhaust manifold. Installations are equally successful with the muffler installed close to the engine or near the stern. The muffler should always have some tail pipe, preferably not shorter than six pipe diameters for best results.

The following methods of installation are suggested as they are representative of the ones most commonly used.

1. If the generating plant is installed below the load water line or there is a possibility of shipping water into the exhaust pipe, a vertical gooseneck loop should be placed in the exhaust line between the condensation trap and the flexible tubing. This loop should extend at least 18 inches above the highest possible water level. The loop and the flexible tubing should be covered with heat insulating material.

The muffler and exhaust line from the muffler to the escape through the hull must be above the load water line and should slope gradually downward from the muffler to the outlet. The outlet must not be submerged. The muffler may be placed in the the exhaust line anywhere that is convenient after the vertical loop. In this installation the cooling water is turned into the exhaust line immediately after the vertical loop, either through the muffler or through the exhaust line proper, whichever is most convenient. See Figure 3.

2. The simplest installation of the generating plant and the water-cooled muffler is made where the entire exhaust line can be made to slope gradually towards the point of outlet through the hull. The water discharge from the engine is piped into the top connection on the muffler which forms part of the trap for the water to protect the engine. See Figure 4.

In similar installations it is sometimes necessary to place the muffler near the stern. With such an arrangement the water should be put into the exhaust line at the engine and the muffler placed in the exhaust line at the most convenient point.

3. If so desired, the muffler may be installed between the generating plant and an exhaust line to the sides of the vessel. The water in this case can be put into the muffler or into the exhaust line, whichever is most convenient. This type of installation is recommended for sailing vessels as the exhaust gases and cooling water will always escape properly regardless of which way the vessel heels. See Figure 5.

INSTALLATION

4. The muffler can be installed in the stern due to space limitations. Here the water is put directly into the exhaust line immediately before the flexible hose and is then blown through the exhaust line.

The low point in the exhaust line should have a drain plug for freezing protection. This installation forces the engine exhaust to raise the water the height of the rise in the exhaust line but if this rise does not exceed 1-1/2 feet, the back pressure will not be enough to perceptibly influence the engine. See Figure 6.

WATER LINE CONNECTION. - Two types of water pumps have been used with the MTK series electric generating plants to circulate the engine cooling water. One is a gear driven, gear type pump. The other is a gear driven, rubber impeller type pump. The maximum vertical lift for either type of pump under average conditions is five feet. The horizontal run at maximum lift should not exceed 20 feet.

The suction opening of the water pump is equipped with a 1/8" pipe fitting. From this fitting a piece of rubber hose should be provided to the source of water supply. It is recommended that a strainer and a check valve be placed in the suction pipe at an accessible point as near to the thru-hull fitting as possible to prevent foreign matter from entering the water pump and to maintain pump prime. The check valve should be installed adjacent to the strainer on the water pump side. The use of a strainer and a check valve is not necessary when a closed type cooling system is used.

With the exception of closed type cooling systems the entire water discharge from the engine should be through the exhaust line.

The water outlet from the cylinder head is 3/8" iron pipe size. The water inlet on the muffler is also 3/8" iron pipe size.

FRESH WATER COOLING. - Closed type cooling systems are commonly referred to as fresh water cooling and will be listed as such throughout this manual.

Fresh water cooling is recommended where the vessel is to be operated in freezing temperatures as it permits the use of antifreeze, thus eliminating the freezing hazard. A fresh water cooling system prevents salt water corrosion and eliminates sand and dirt deposits in the engine water jackets and pump. It will eliminate excessive pump wear and salt and mineral caking in the cylinder water jackets which lowers engine efficiency.

A fresh water cooling system also serves to protect the cylinder head and block from the danger of cracking because of a sudden change in water temperature. Most accidents of this kind are caused by cold

water rushing into the engine jackets when restarting the plant while the engine is still hot, resulting in a sudden contraction of the metal. It will be necessary to install a separate water pump to furnish cooling water for the exhaust line when using a fresh water cooling system. Consult your marine dealer as to the type best suited for your installation.

In most installations where the vessel's prime mover is equipped with a heat exchanger, it is possible to utilize this source of fresh water for cooling the generating plant as the additional heat placed on the main engine's cooling system is very small. Heat exchangers and various types of fresh water cooling systems, suitable for use with these electric generating plants are commercially available.

Also available is a chemical process whereby both the salt and fresh water sides are protected from rust and mineral caking. Details concerning the Model A "Aqua-Clear" process may be obtained from Sudbury Laboratory, Box 487, South Sudbury, Massachusetts.

FUEL SYSTEM

FUEL TANK. - Where the vessel is powered by a gasoline engine, fuel may be taken from the main fuel tank to operate the electric generating plant. When supplying fuel for the generating plant from the main tanks, it is best to install a separate fuel outlet to avoid trouble caused by the main engines starving the generator or the generator drawing air through the siphon-break orifice in the fuel tank when operated alone. It is also permissible to install a separate fuel tank. Regardless of the type of fuel tank used, the top of the fuel tank must not be less than 6 inches below (unless a siphon-break or a reservoir tank is used) and the bottom of the tank not more than 6 feet below the fuel pump inlet.

The carburetor float valve cannot always be depended upon to hold back the fuel if there is a gravity head. Also there are times when a little piece of dirt may get under the valve seat and allow fuel to leak through. The fuel lift should not exceed 6 feet due to the fact that the fuel pump will lift fuel dependably only 7 or 8 feet.

If a separate fuel tank is installed, the tank should be located in a water-tight compartment as close as possible to the generating plant compartment. It should be accessible for exterior examination and mounted above the load water line in a pan or on a metal lined, water-tight flat with overboard drains. Such pan or flat is not recommended where the bottom of the fuel tank is below the load water line.

Where this arrangement is not practicable, the fuel tank may be located to suit the design of the vessel but preferably adjacent to the engine compartment to avoid the use of excessive lengths of fuel pipe. The

tank should be substantially secured in position to prevent movement and installed to afford easy external examination and accessibility for servicing. Portable tanks should not be used below decks.

All fuel tank outlets must pass through the top of the tank. Fill pipes and sounding holes shall be so arranged that vapors or possible overflow when filling cannot escape to the inside of the boat. A pipe made tight to the tank and to a filling plate on the deck outside of the cockpit or coamings meets these requirements.

Fill pipes should extend nearly to the bottom of the tank and a strainer of non-corrodible wire mesh fitted into the throat of the fill pipe. Vents or reliefs leading outboard shall be provided on all gasoline tanks. On vessels liable to heel, two vents shall be led to starboard and two to port.

A shut-off valve should be installed as close to the tank as practicable and one as close as practicable to the fuel pump inlet. Valves for gasoline fuel lines shall be of non-ferrous metal with ground seats and installed so as to close against the flow. Locks of any kind are not approved for use in gasoline fuel lines aboard.

SIPHON-BREAK OR RESERVOIR TANK SYSTEM

In many marine installations the fuel supply tank will be installed higher than the fuel pump inlet or even the carburetor inlet of the electric plant. This requires that special precautions be taken to guard against possible leakage at the carburetor float valve due to the gravity head created by the weight of the fuel in the tank or because of the possibility of a piece of dirt holding the float valve open. There are two recommended methods of controlling this problem. One is the siphon-break system; the other is the reservoir tank system.

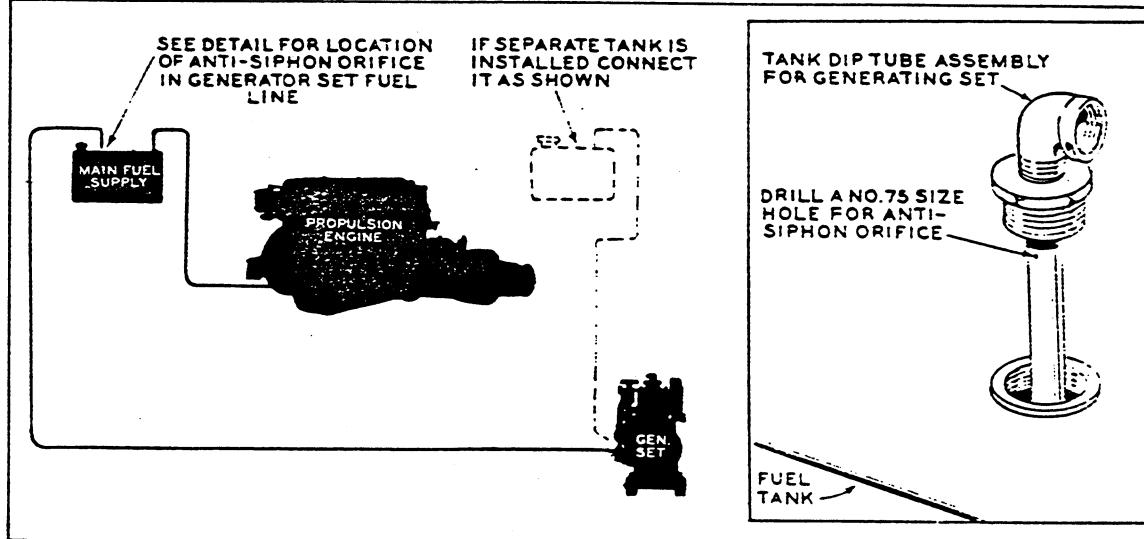


FIG. 7 - SYPHON-BREAK SYSTEM

SIPHON-BREAK SYSTEM. - The siphon-break system incorporates a small orifice in the fuel tank outlet tube (Fig. 7) to allow air to bleed in and stop fuel siphoning when the engine is stopped. If a separate fuel outlet is installed in the main fuel tank or a separate tank installed for the generator, drill a #75 hole in the top of the tube, just inside the tank, to serve as a siphon break. In most cases, the anti-siphon orifice in the main tank outlet is large enough that the generator will draw only air when operated alone.

RESERVOIR TANK SYSTEM. - The reservoir tank system employs a small capacity tank that can be mounted at some convenient place aboard which is higher than the fuel supply tank. Fuel is run from the fuel supply tank to the fuel pump inlet, from the fuel pump outlet to the side fitting near the top on reservoir tank, from the fitting near the bottom on reservoir tank to the carburetor inlet. The side fitting near the top on reservoir tank is for connecting a return line (larger size) to separate fitting in the fuel supply tank. The bottom fitting is for a drain plug, fitting on top is for air vent line. See Figure 8.

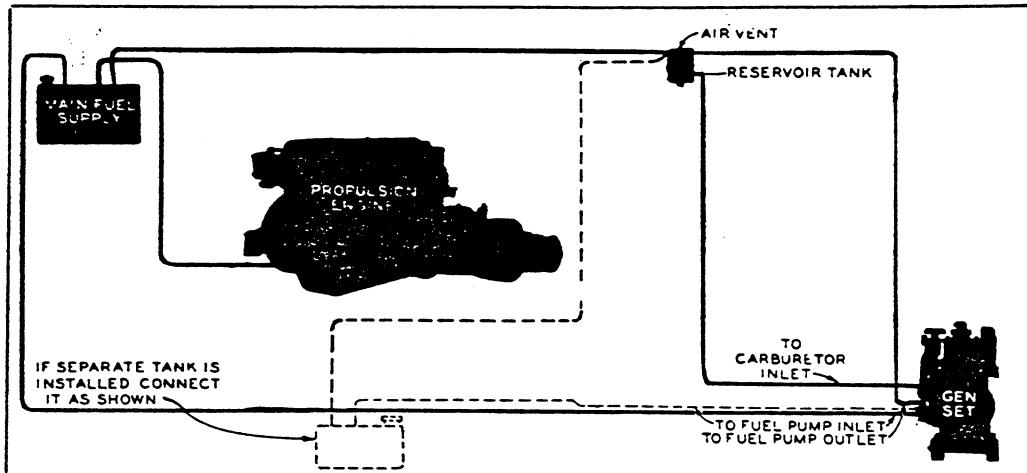


FIG. 8 - RESERVOIR TANK SYSTEM

FUEL LINES. - Fuel lines shall be of seamless drawn annealed copper tubing or iron pipe of copper tubing size. They shall be run in sight whenever practicable, protected from mechanical injury and effectively secured against vibration by neat fitting, soft metal lined or non-ferrous metal clips with no sharp edges in contact with the tubing. Where passing through steel decks or bulkheads, lines shall be protected by close fitting ferrules of non-abrasive material. The fuel inlet on the fuel pump requires a 1/8" iron pipe size fitting.

The installation of a flexible fuel line between the plant and the rigid fuel line is recommended. If a flexible fuel line is not used, make a

loop in the solid line near the plant to absorb vibration. The loop should be made in a vertical downward position so that the fall of fuel will be toward the fuel tank.

WIRING. - Observe all applicable electrical codes and regulations.

Both the United States Coast Guard and the National Fire Protection Association list standards for marine electrical wiring.

All wiring shall be run as high as practicable above the accommodation flooring. Surface wiring shall be protected. However, the extended use of conduit or metallic tubing is not recommended because of the possibility of moisture accumulating therein.

Concealed wiring may be unprotected but shall be secured by neat fitting, non-ferrous cleats with rounded edges spaced not more than 14" apart.

Lead sheathed, unarmored conductors and conductors armored with spiral wound flat metal stripping are not approved. Conductors armored with metallic basket weave or helical wire, with or without lead sheathing, may be used.

Wiring joints and splices shall be mechanically secure. Unless a splice is made by a solderless wire connector, it shall be thoroughly soldered. Where ends of stranded conductors are to be clamped under terminal screws, they shall be formed and soldered unless fitted with solderless lugs.

Splices, unless provided with insulated wire connectors, shall be first taped with rubber tape, then with friction tape to afford insulation equivalent to that of the conductors joined.

Protect each branch circuit of the system with a fuse of the proper amperage according to the carrying capacity of the wire in the circuit regardless of the total load that may be connected to the circuit. Such fuses are in addition to the main fuse that protects the entire system.

Accessories such as switches, fuses and sockets shall be standard National Electrical Code types for the loads to be carried.

Lighting and power switches and light fixtures in the engine room, fore-peak and galley (if gas is used for the range) shall be of the explosion proof type. The use of explosion proof switches throughout the under deck is recommended.

WIRING TABLE - 32 VOLT

Distances are approximate and are expressed in feet per wire size with a 2-1/2% (.82) voltage drop.

WIRE SIZE NO. WATTS	12 AMPS	12	10	8	6	4	2
50	1.56	150	240	440	610	970	1490
100	3.13	75	120	220	305	485	745
150	4.69	50	80	140	205	325	495
200	6.25	40	60	110	150	240	370
250	7.81	30	50	85	125	195	295
300	9.38	25	40	70	100	160	250
400	12.50	20	30	55	75	120	185
500	15.63	15	25	45	60	95	150
600	18.75	12	20	35	50	80	125
800	25.00	10	15	30	40	60	90
1000	31.25		12	25	30	50	75
1500	46.88			15	20	30	50
2000	62.50				15	25	40
2500	78.13					20	30
3000	93.76						25
3500	109.59						20

The above figures represent a point to point distance for a two wire run. If a 5% voltage drop is permissible, double the distances listed.

WIRING TABLE - 115 VOLT - AC or DC

Distances are approximate and are expressed in feet per wire size with a 2-1/2 (2.882) voltage drop.

WIRE SIZE NO. WATTS	14 AMPS	12	10	8	6	4	2
100	.87	600	1000	1600	2560	4060	6460
200	1.74	300	500	800	1280	2030	3230
300	2.61	200	330	530	850	1350	2150
400	3.48	150	250	400	640	1015	1615
500	4.35	120	200	320	510	810	1290
750	6.52	80	130	210	340	540	860
1000	8.69	60	100	160	255	405	645
1500	13.04	40	65	105	170	270	430
2000	17.38	30	50	80	125	200	320
2250	19.56		40	65	100	160	255
3000	26.07		30	50	85	135	215
							340

The above figures represent a point to point distance for a two wire run. If a 5% voltage drop is permissible, double the distance listed.

CONNECTING REMOTE START-STOP STATIONS. - All alternating current plants and the 115 volt direct current plants have provisions for connecting remote start-stop stations at various points aboard. Use No. 18 wire and proceed as follows:

Connect the switch common (center) terminal to the No. 1 terminal of the plant. Connect another terminal of the switch to the terminal block number 2 position. Connect the remaining switch terminal to the terminal block number 3 position. Number 2 is the stopping circuit, Number 3 is the starting circuit, and number 1 is grounded. The plant B+ terminal is used only with line transfer equipment. If additional remote switches are installed, they must be connected in a parallel circuit.

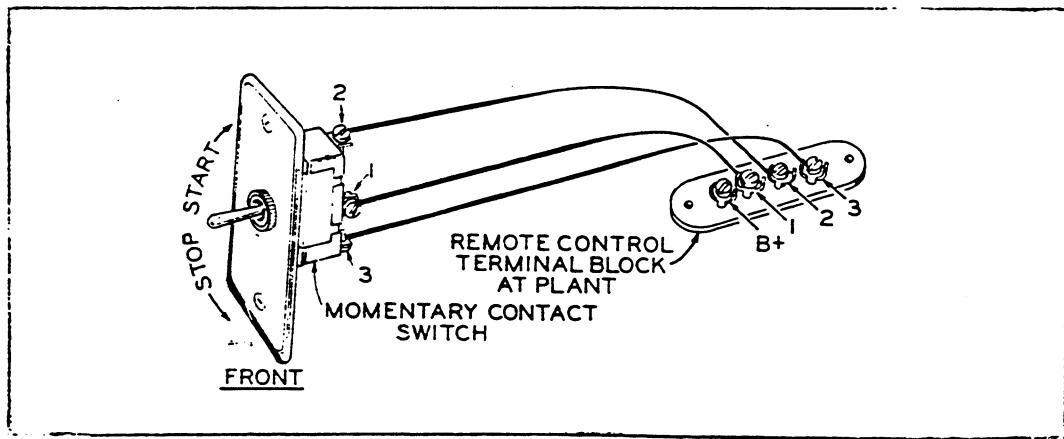


FIG. 9 - REMOTE START-STOP STATIONS

CONNECTING THE LOAD. - Read all instructions under WIRING before connecting the main line wires. Refer to the illustrations in the installation section of the manual that accompanied your plant. Then make connections to your plant as follows:

1 PHASE, 2 WIRE AC PLANTS. - The output terminal block is marked "M1" and "M2". Connect the "hot" side of the main line to the terminal marked "M1". Connect the "grounded" side of the main line to the terminal marked "M2".

1 PHASE, 3 WIRE AC PLANTS. - The terminal block is marked "M1", "M2" and "M3". Both 115 volt and 230 volt current are available with this type of plant. However, the wires must be properly connected or serious damage may result to the equipment being operated. Proceed as follows:

There are two 115 volt circuits available, the output capacity of each circuit being 1/2 the rated capacity of the generator.

There is one 230 volt circuit available with an output capacity of 3000 watts provided no 115 volt current is being used at the same time.

If a single 115 volt circuit is to be used, connect the "grounded" side of the main line to the terminal marked "M2". Connect the "hot" side of the main line to either "M1" or "M3". The total load on the circuit should not be more than 1/2 the rated generator capacity.

If both 115 volt circuits are to be used, connect the "hot" lead of one circuit to "M1" and the "Hot" lead of the other circuit to "M3". Connect the "ground" lead of both circuits to "M2". The load on either circuit should not be more than 1/2 the rated generator capacity.

For a 230 volt circuit, connect one main line to "M1" and the other main line wire to "M3". "M2" is not used with a 230 volt circuit. The full rated generator capacity is available on this circuit provided that current is not being used from either 115 volt circuit.

If both 115 volt current and 230 volt current are used at the same time, the amount of 230 volt current should be limited to the difference between that used on the 115 volt circuit most heavily loaded and the rated capacity of the generator. For example: If the 115 volt circuit carrying the heaviest load uses 750 watts, then 1500 watts of 230 volt would be available.

115 VOLT DC PLANTS. - Connect the "hot" side of the main line to the generator lead marked "A1". Connect the "grounded" side of the main line to the generator lead marked "A2". When joining these wires, use approved connectors and follow the recommendations given under WIRING in this section.

115 VOLT AC - 32 VOLT DC PLANTS (DUAL PURPOSE)

115 VOLT AC LOAD CONNECTIONS. - Connect the "hot" side of the a-c main line to the generator lead marked "M1". Connect the "grounded" side of the a-c main line to the generator lead marked "M2". Use approved connectors and follow the recommendations given under WIRING in this section.

32 VOLT DC LOAD CONNECTIONS. - Connect the 32 volt d-c load as described for the 32 volt Battery Charging Plants.

CAUTION

Remember that a total of up to 750 watts of direct current and 2250 watts of alternating current may be used at the same time or divided in any proportion within the rated output limits of the generator. Maximum d-c output should not exceed 750 watts. Total current available is 3000 watts. If only alternating current is used, 3,000 watts is available. When direct current is used, subtract the amount of direct current used from the total generator capacity to find the amount of alternating current available. For example: If 500 watts of d-c is used, only 2500 watts of a-c is available.

32 VOLT BATTERY CHARGING PLANTS. - The load should be connected to the batteries through a fused switch or circuit breaker. The lead wires from the battery fuse block to the main line fuse block should be of sufficient size to carry the full rated capacity of the generator plus the full rated capacity of the battery. Branch circuits from the main circuit should be properly fused. Smaller wire may be used for these branch circuits but the wire should be large enough to carry the amperage of the load on each circuit.

Make connections from the main line switch to the fused battery switch. Connect leads to the terminals on the battery side of both switches. Observe the same polarity used in connecting the battery. See Figure 11.

CONNECTING THE BATTERY. - These plants are designed to operate with either a negative or a positive grounding of the battery without regard to polarity. However, unless the generator is properly grounded with respect to other electrical equipment aboard, severe electrolysis (chemical) action will be set up when the unit is running. This will cause damage to propellers, sea cocks and other fittings which contact salt water.

AMMETER READINGS. - Ammeter readings on these units will be correct only with a negative ground. With a positive ground the ammeter readings will be reversed. This can be remedied by reversing the wires connected to the ammeter terminals.
THE AMMETER WIRES MUST BE REVERSED ON ALL BATTERY CHARGING UNITS IF THE UNIT IS POSITIVE GROUNDED.

BATTERY CONNECTIONS FOR ALTERNATING CURRENT PLANTS. - For a positive grounding of the battery, connect one cable from the positive (+) post on the battery to the terminal marked GROUND on the plant control panel and the other cable from the negative (-) post on the battery to the adjacent terminal.

For a negative grounding of the battery, connect one cable from the negative (-) post on the battery to the terminal marked GROUND on the plant control panel and the other cable from the positive (+) post on the battery to the adjacent terminal.

If two 6-volt batteries are to be connected in series to form a 12-volt battery, connect a short jumper cable from the negative (-) post of one battery to the positive (+) post of the other battery before making the above connections.

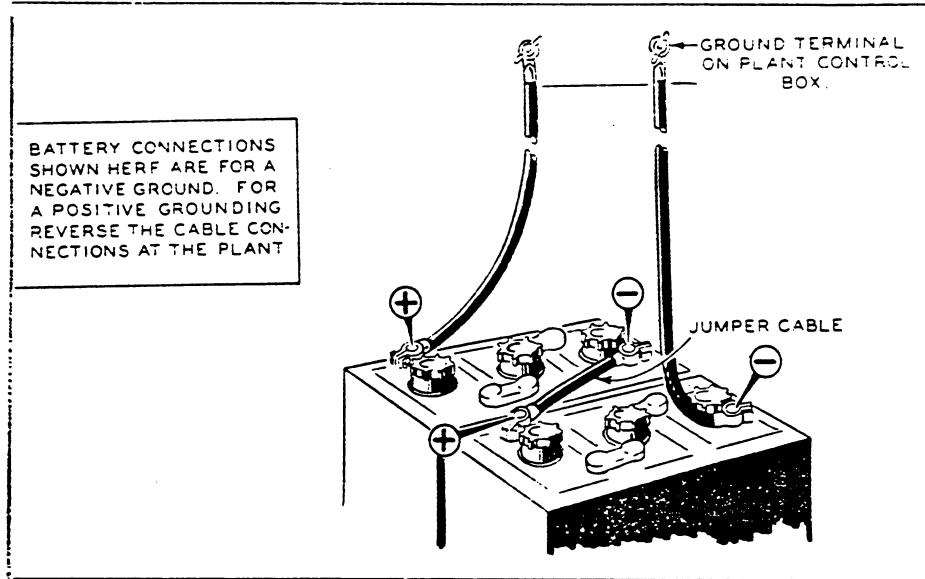


FIG. 10 - BATTERY CONNECTIONS - ALTERNATING CURRENT

BATTERY CONNECTIONS FOR BATTERY CHARGING PLANTS. - Battery cables and batteries are not supplied with battery charging units. However these are readily available from your local marine dealer.

Prepare the batteries for operation and install them according to the battery manufacturers instructions.

A fused switch should be installed between the plant and the batteries as shown in Figure 11. Run cable from the battery to the switch and then from the switch to the plant control panel.

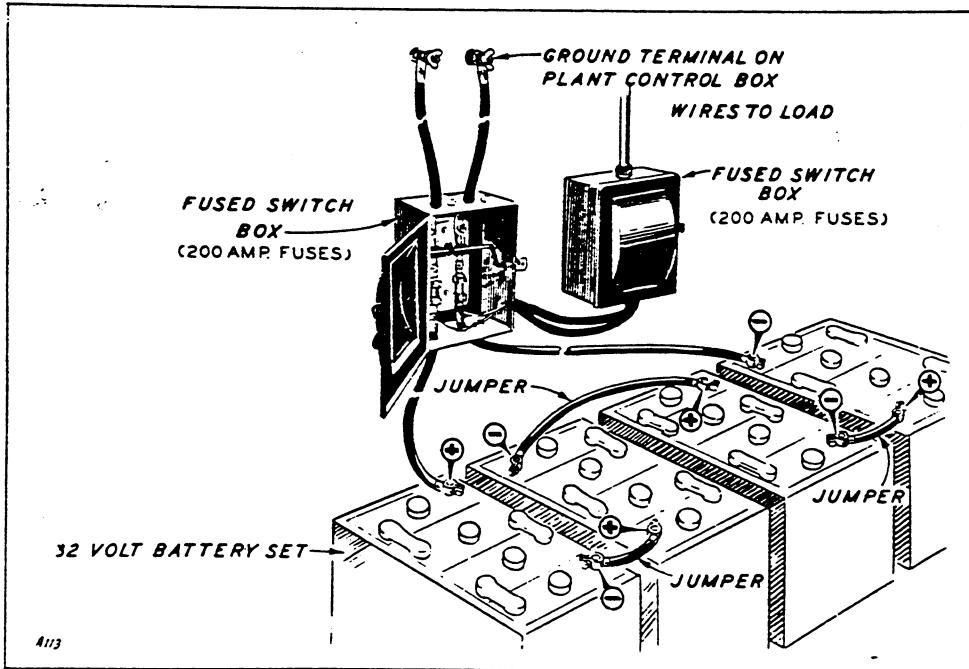


FIG. 11 - BATTERY CONNECTIONS - BATTERY CHARGING PLANTS

For a positive grounding of the battery, connect one cable from the positive (+) post on the battery to the grounded side of the fused switch. Connect a second cable from the grounded side of the fused switch to the terminal marked GROUND on the plant control panel. Make connections from the negative (-) post on the battery to the ungrounded side of the switch and to the remaining terminal on the plant control panel, using cables of equal size and length to those used for the positive cable connections. CAUTION: Connections must be reversed at the ammeter terminals when using a positive ground.

For a negative grounding of the battery, connect one cable from the negative (-) post on the battery to the grounded side of the fused switch. Connect a second cable from the grounded side of the fused switch to the terminal marked GROUND on the plant control panel. Make connections from the positive (+) post on the battery to the ungrounded side of the switch and to the remaining terminal on the plant control panel, using cables of equal size and length to those used for negative cable connections.

CAUTION

ALL PLANTS

Do not hand crank your unit on the initial run after completing the installation without first pressing the START button. It is this cranking current that excites the generator field in the proper direction for the polarity that you have used. After the initial run the generator will maintain this polarity and the unit may be hand cranked if so desired.

AUXILIARY LIGHTING CURRENT (Alternating Current Plants). - An auxiliary lighting circuit may be connected to the starting battery if so desired. This auxiliary circuit will provide for a night light, trouble or service light. The maximum load on this circuit should not exceed 150 watts at any time. Lights, fixtures, connectors, and wire should conform to those needed for a 12-volt d-c circuit. Make connections directly at the battery.

WATER PUMP. - Two different types of water pumps have been used with MTK series electric generating plants, the gear type pump and the impeller type pump. The water pump should be primed before starting a new engine or whenever the cooling system has been drained. Prime as shown in Figure 13.

If the water pump shaft seal leaks (water drips from relief hole) when first operating after storage, try to restore the seal's resiliency, by stopping the engine after warm-up, to allow the seal to warm up from engine heat.

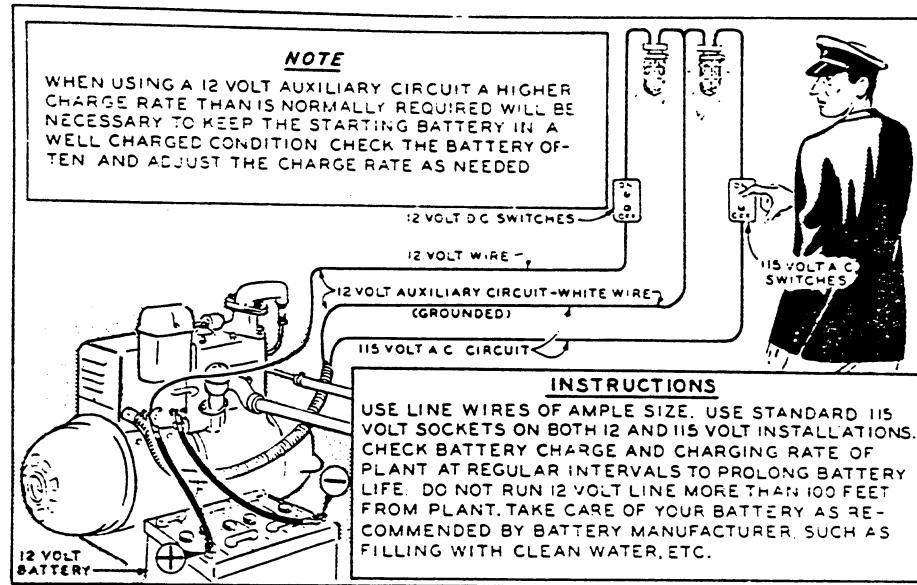


FIG. 12 - AUXILIARY LIGHTING CIRCUIT - ALTERNATING CURRENT PLANTS

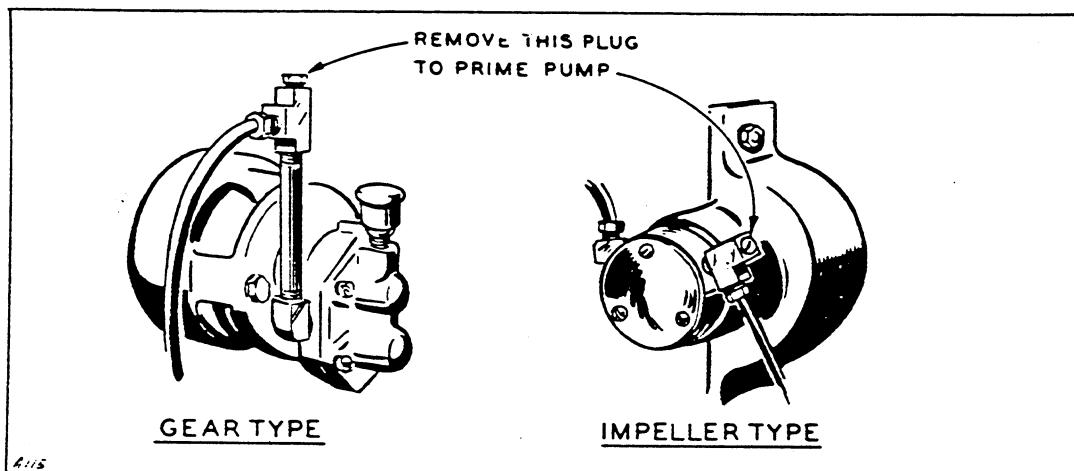


FIG. 13 - PRIMING THE WATER PUMP

ADDITIONAL INFORMATION

FRESH WATER COOLING SYSTEM. - If a closed cooling system is used fill the system with clean alkali free water until the water in the expansion tank is at the level recommended by the manufacturer or supplier of the system. If the preparation is for below freezing temperatures, use an approved anti-freeze in the proportion recommended by its manufacturer.

Do not change the water oftener than necessary to keep the cooling system clean or to change the antifreeze. Allow a hot engine to cool before draining the cooling system.

ADJUSTMENT FOR NEUTRAL BRUSH POSITION. - Check the generator brush rig to see that it has not moved from its original position. This should be done semi-yearly or whenever brush wear becomes excessive. Brushes will wear rapidly and arcing will be excessive if the brushes are out of neutral position.

Two different methods of mounting the brush rig on these plants are used and both are shown in Figure 14. The neutral brush position is marked and the mark identified by a paint mark. Select the one that applies to your plant and proceed as follows:

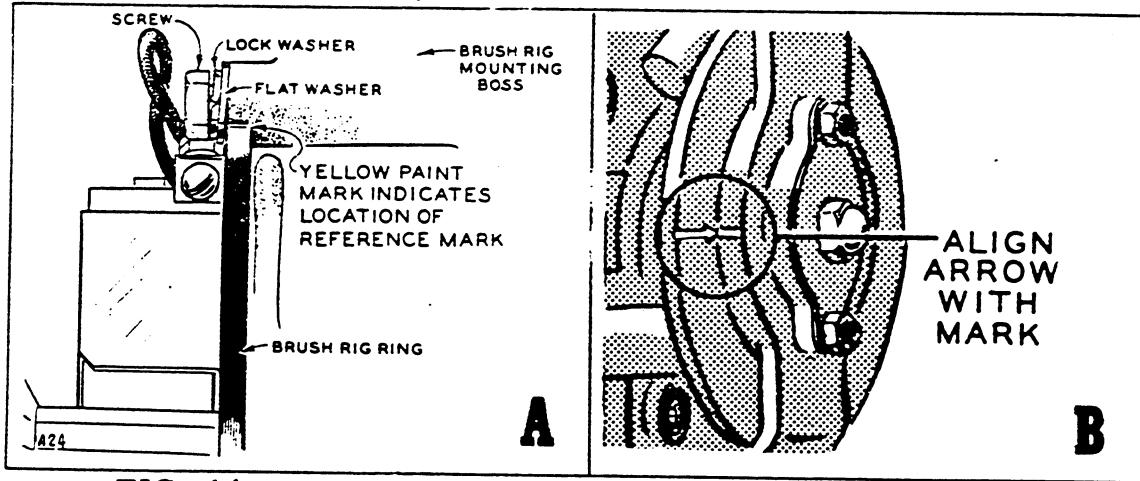


FIG. 14 - NEUTRAL BRUSH POSITION MARKS

If the brush rig is mounted as shown in Figure 14A, the location of the "neutral brush position" mark is indicated by a paint mark on the brush rig ring near one of the mounting screws. This mark should be in the position shown in Figure 14A. If it is not, loosen the brush rig mounting screws and shift the whole brush rig assembly as needed to align the mark. Tighten the mounting screws securely.

If the brush rig is mounted as shown in Figure 14B, the location of the "neutral brush position" mark is indicated by an arrow on the brush rig spider and a paint mark on the bearing support. These marks should be aligned. If they are not, loosen the nuts on the bearing support and shift the spider and brush rig as needed to align the marks. Tighten the nuts securely.

CAUTION

If a new armature or brush rig is installed, the "neutral brush position" must be relocated and remarked. Neutral brush position is that point at which no arcing of the brushes occurs. Full instructions are supplied with all replacement brush rigs and armatures.

OPERATION IN FREEZING TEMPERATURES. - The entire cooling system must be drained as soon as the engine stops if the plant is operated during freezing temperatures, unless a fresh water system is used and protected with antifreeze. Even with a fresh water cooling system the water must be drained from the exhaust line.

CARBURETOR FLOAT LEVEL. - Two different types of carburetors have been used on the MTK series electric generating plants, a Zenith Carburetor and a Marvel Schebler Carburetor.

The correct float level for the Zenith carburetor is $1\frac{13}{32}$ " with the cover and float held in the position shown in Figure 15A. If necessary to adjust, carefully bend the float lever at a point near the shaft. Measure from the underside of the bowl cover to the bottom of the float with the cover gasket removed.

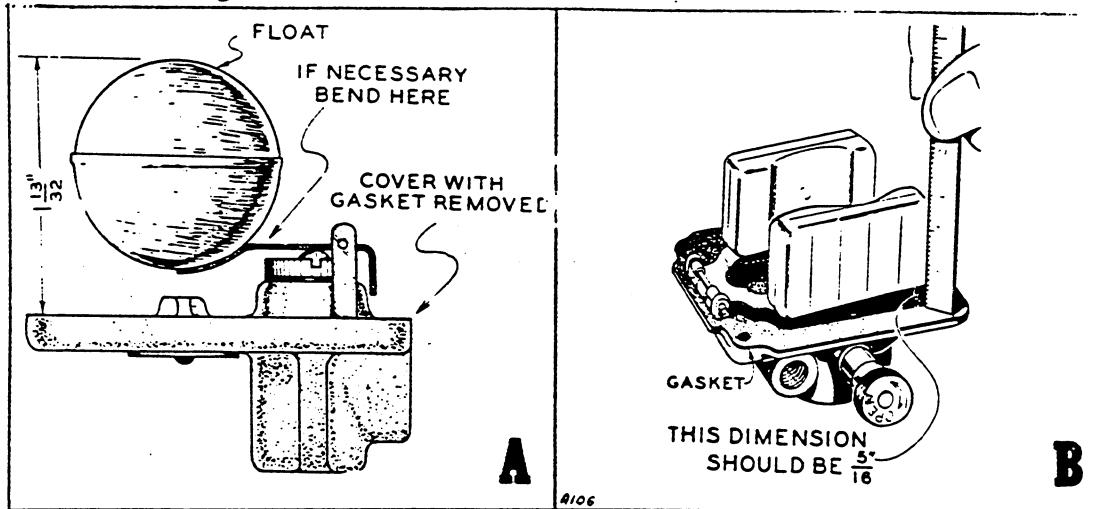
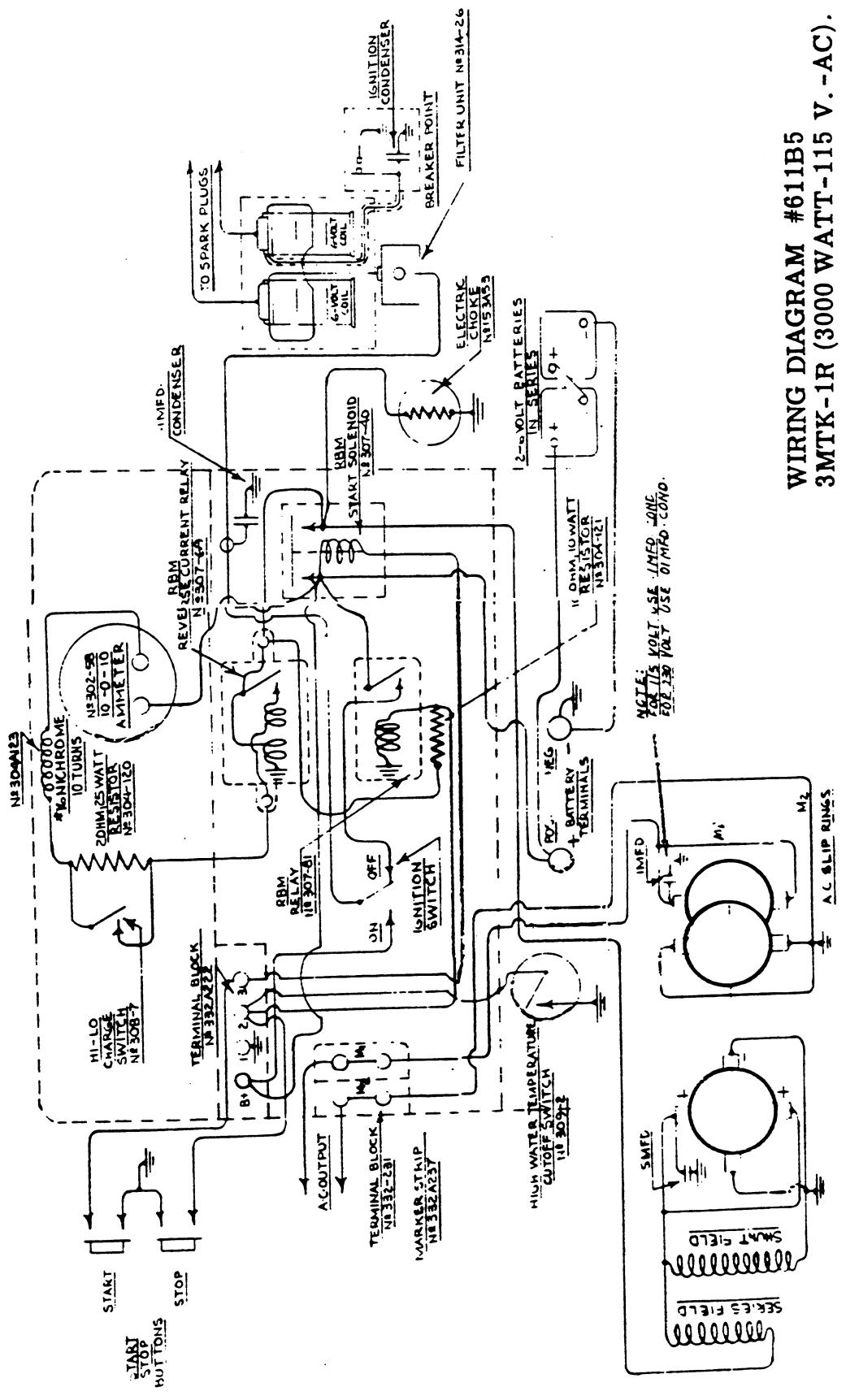


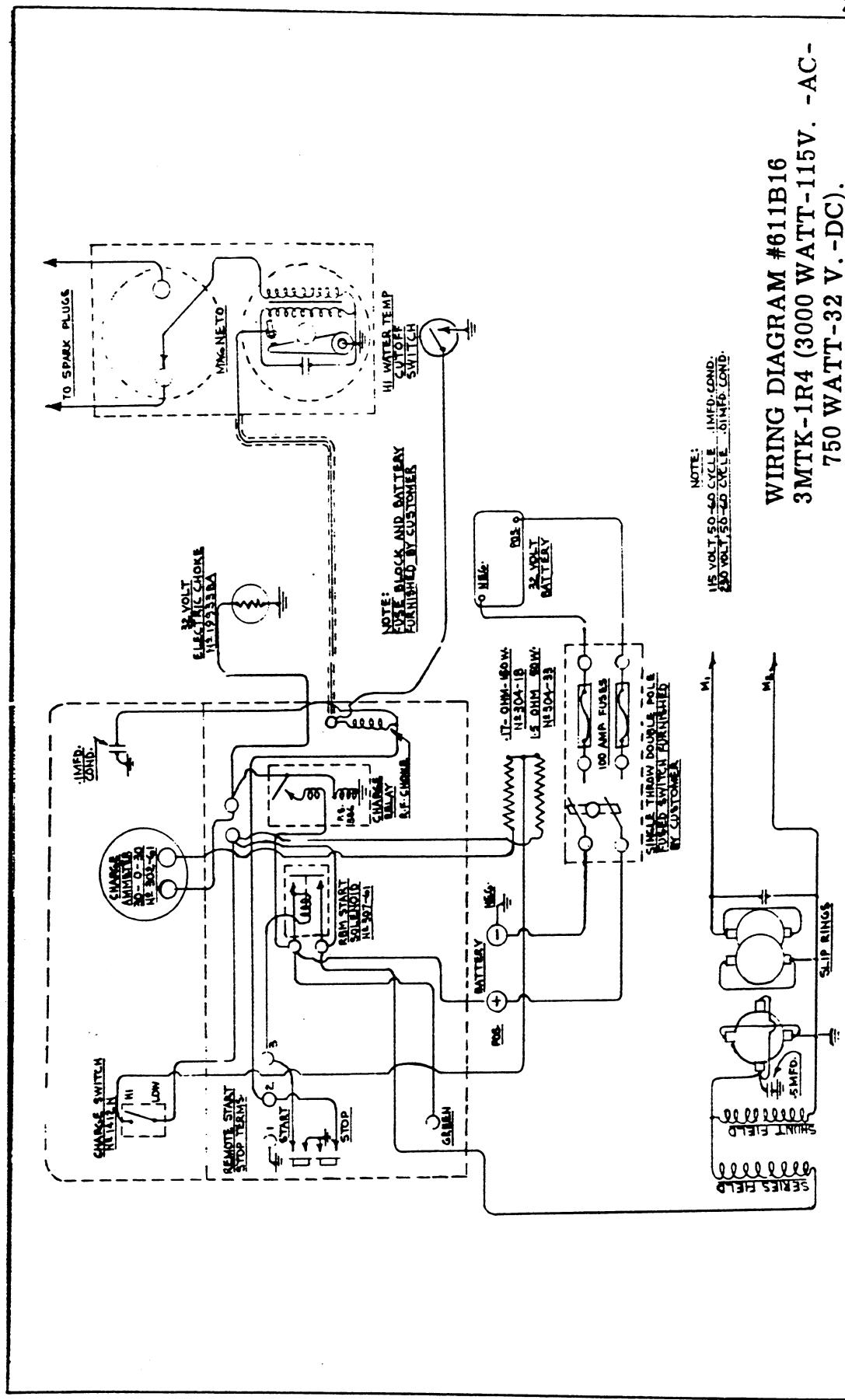
FIG. 15 - CARBURETOR FLOAT LEVEL

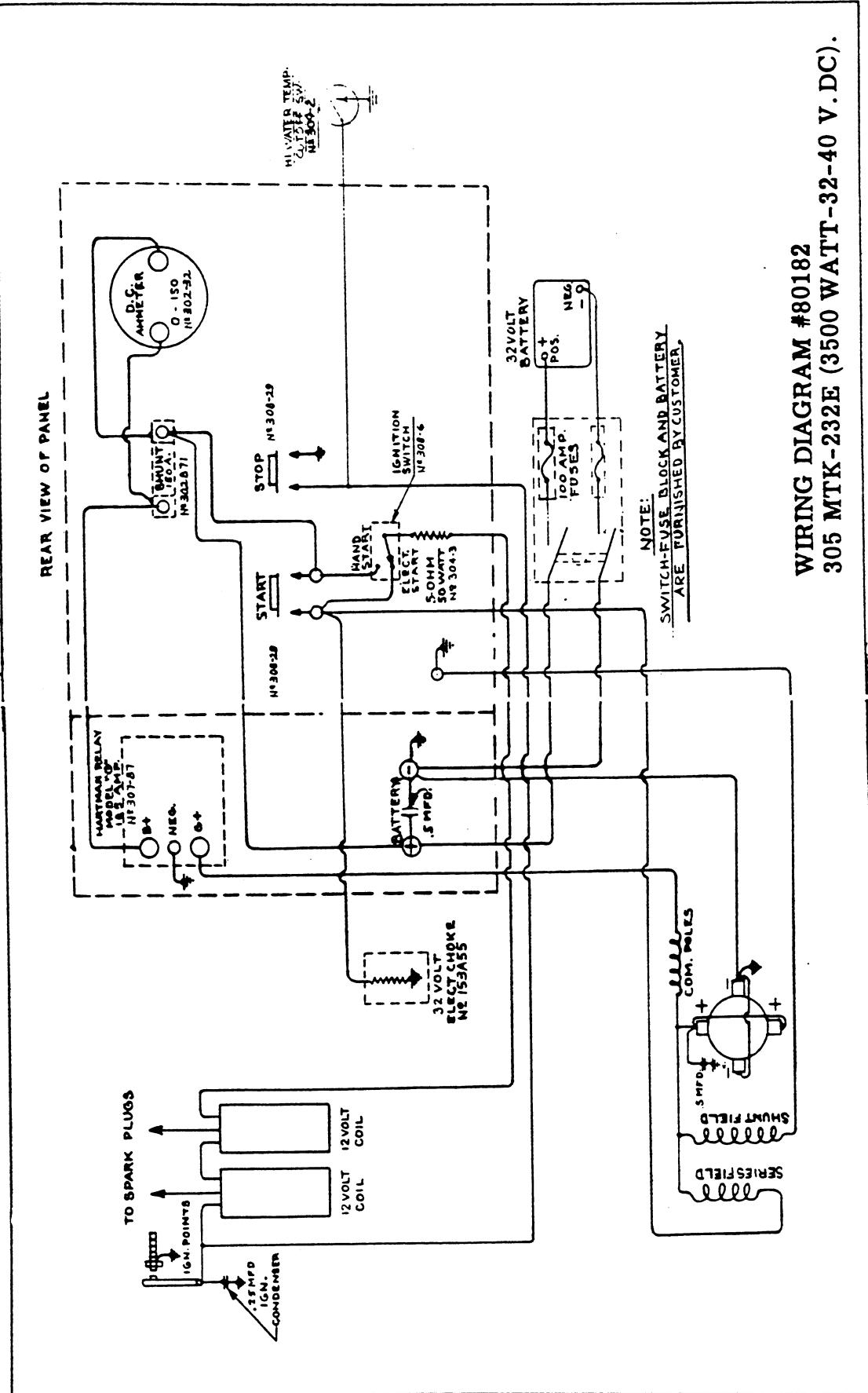
The correct float level for the Marvel Schebler carburetor is $5/16$ " with the cover and float in the position shown in Figure 15B. If necessary to adjust, carefully bend the float lever at a point near the shaft. Measure from the underside of the bowl to the top of the float with the cover gasket in place.

Should a leak occur in one section of the float, the leaky section should be removed. The carburetor will operate satisfactorily on one float section until a new float can be obtained and installed.

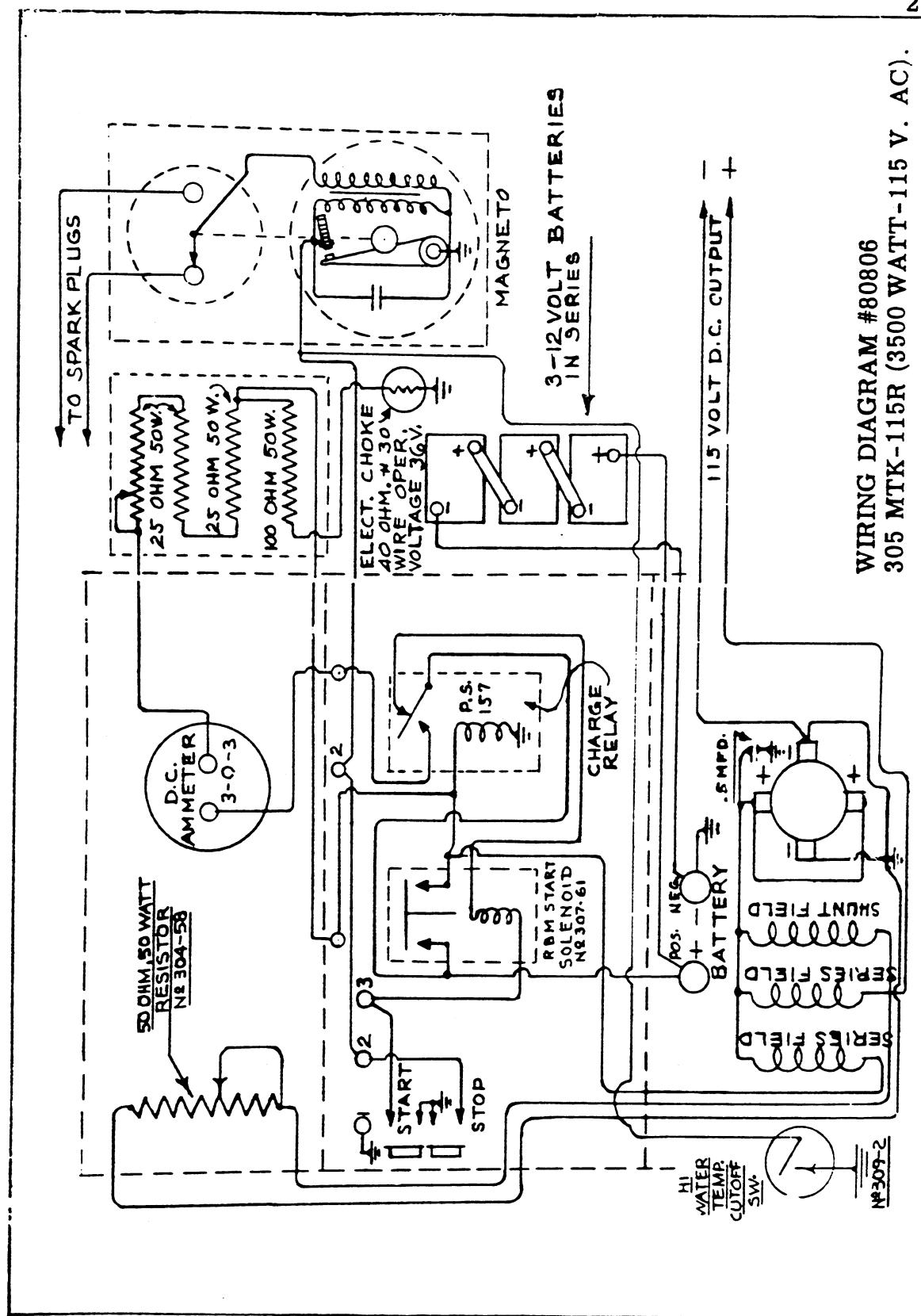
WATER PUMP LEAK. - If the water pump shaft seal leaks (water drips from relief hole) when first operating after storage, try to restore the seal's resiliency, by stopping the engine after warm-up, to allow the seal to warm up from engine heat.







WIRING DIAGRAM #80182
305 MTK-232E (3500 WATT-32-40 V. DC).



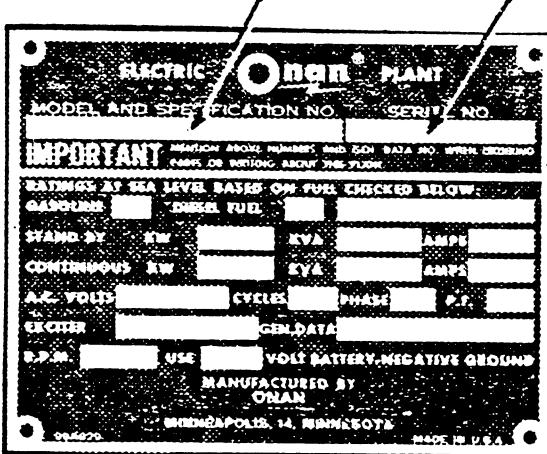
INSTRUCTIONS FOR ORDERING REPAIR PARTS

FOR PARTS OR SERVICE, CONTACT THE DEALER FROM WHOM
YOU PURCHASED THIS EQUIPMENT OR REFER TO YOUR NEAR-
EST AUTHORIZED SERVICE STATION.

TO AVOID ERRORS OR DELAY IN FILLING YOUR PARTS ORDER, PLEASE
FURNISH ALL INFORMATION REQUESTED.

REFER TO THE NAMEPLATE ON YOUR PLANT

1. Always give the MODEL & SPEC. NO. and SERIAL NO.



2. Order only parts that have a quantity shown under the "Parts Reference Letter" that applies to your plant. These letters are listed under "Quantity Used" in the parts list. "Parts Reference Letters" are given in the Data Table.
3. Do not order by reference number or group number, use part number and description.
4. Give the part number, description and quantity needed of each item. If an old part cannot be identified, return the part prepaid to your dealer or nearest AUTHORIZED SERVICE STATION. Print your name and address plainly on the package. Write a letter to the same address stating the reason for returning the part.
5. State definite shipping instructions.

Any claim for loss or damage to your unit in transit should be filed promptly against the transportation company making the delivery. Shipments are complete unless the packing list indicates items are back ordered.

"Prices are purposely omitted from this Parts Catalog due to the confusion resulting from fluctuating costs, import duties, sales taxes, exchange rates, etc.

For Current parts prices, consult your Onan Dealer, Distributor or Parts and Service Center."

"En esta lista de partes los precios se omiten de propósito, ya que bastante confusión resultó de fluctuaciones de los precios, derechos aduanales, impuestos de venta, cambios extranjeros etc.

Consiga los precios vigentes de su distribuidor de productos "ONAN".

Parts Reference Letters

FOR PLANT MODEL NO.	USE	† PARTS REFERENCE LETTER
3MTK-1R	USE	A
3MTK-1R4	USE	B
305MTK-232E	USE	C
305MTK-115R	USE	D

† THESE PARTS REFERENCE LETTERS ALSO APPEAR AT THE TOP OF THE "QUANTITY USED" COLUMNS OF THE PARTS LIST. WHEN ORDERING PARTS, ORDER ONLY PARTS HAVING A QUANTITY SHOWN UNDER THE LETTER THAT APPLIES TO YOUR PLANT. PLANT MODEL NUMBER IS LISTED ON THE PLANT NAMEPLATE.

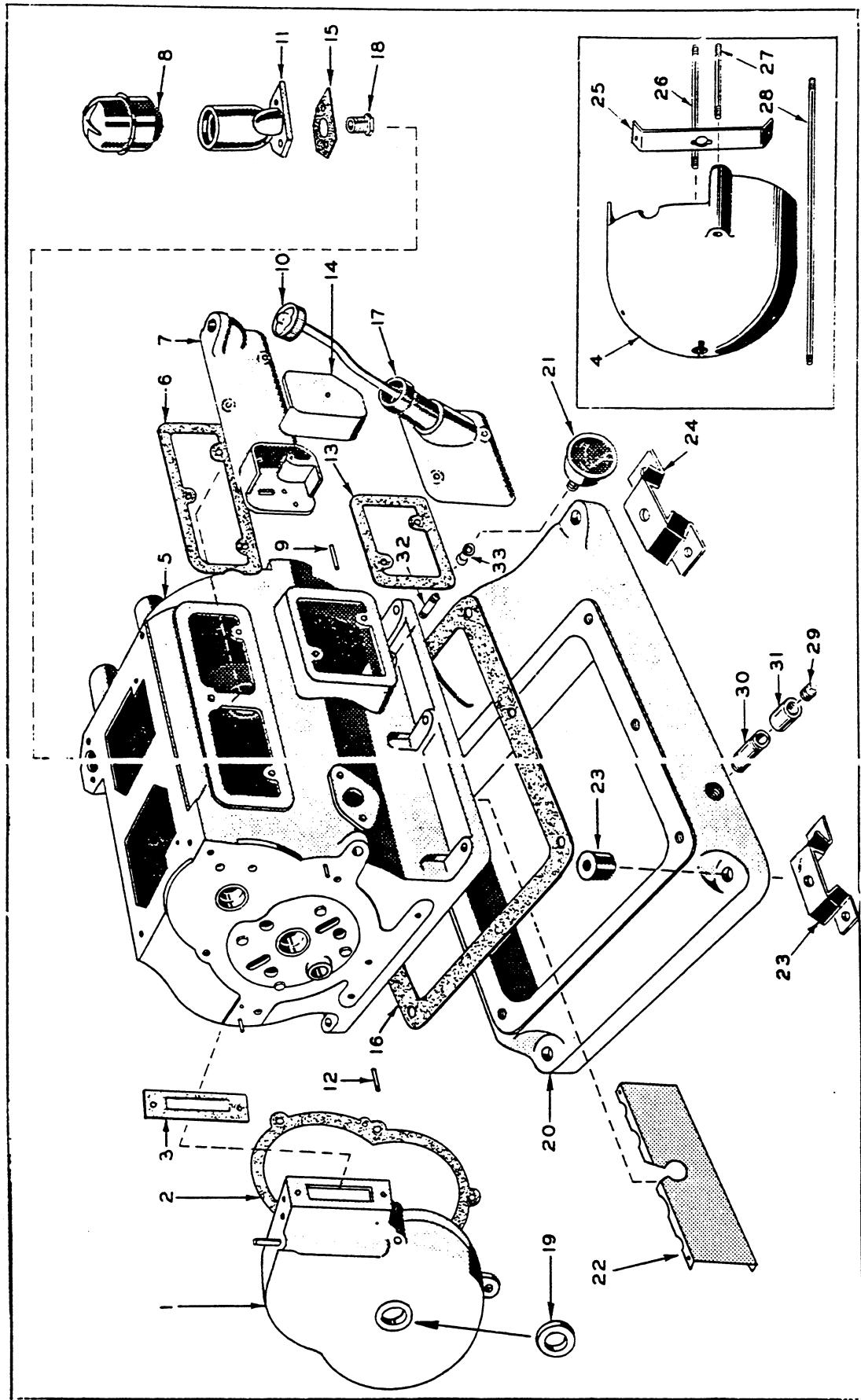


FIG. A - CRANKCASE, OIL BASE, AND GEAR COVER GROUP

**FIG. C - PISTON AND CON
ROD GROUP**

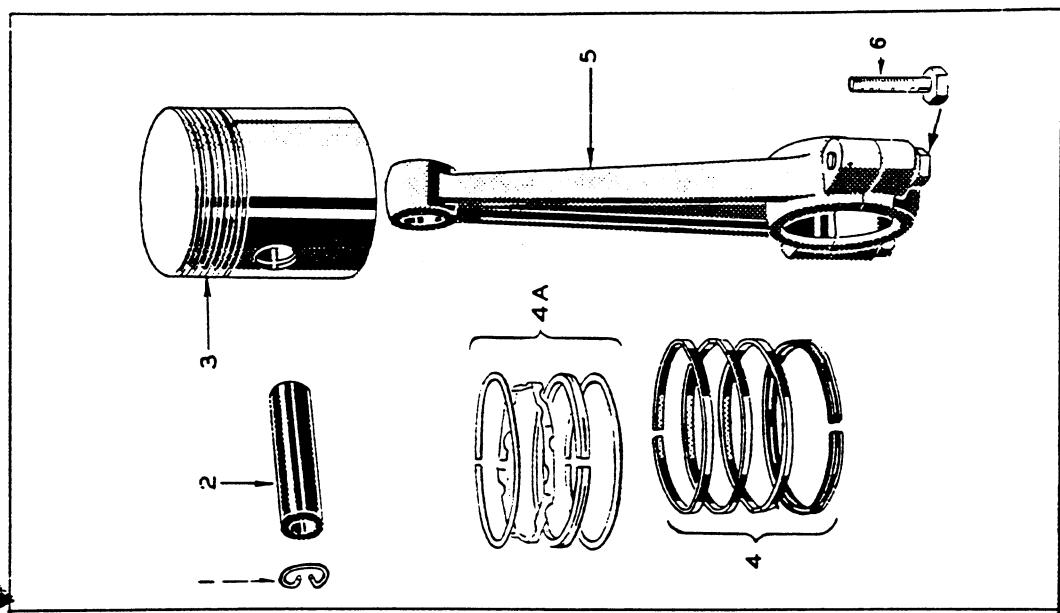
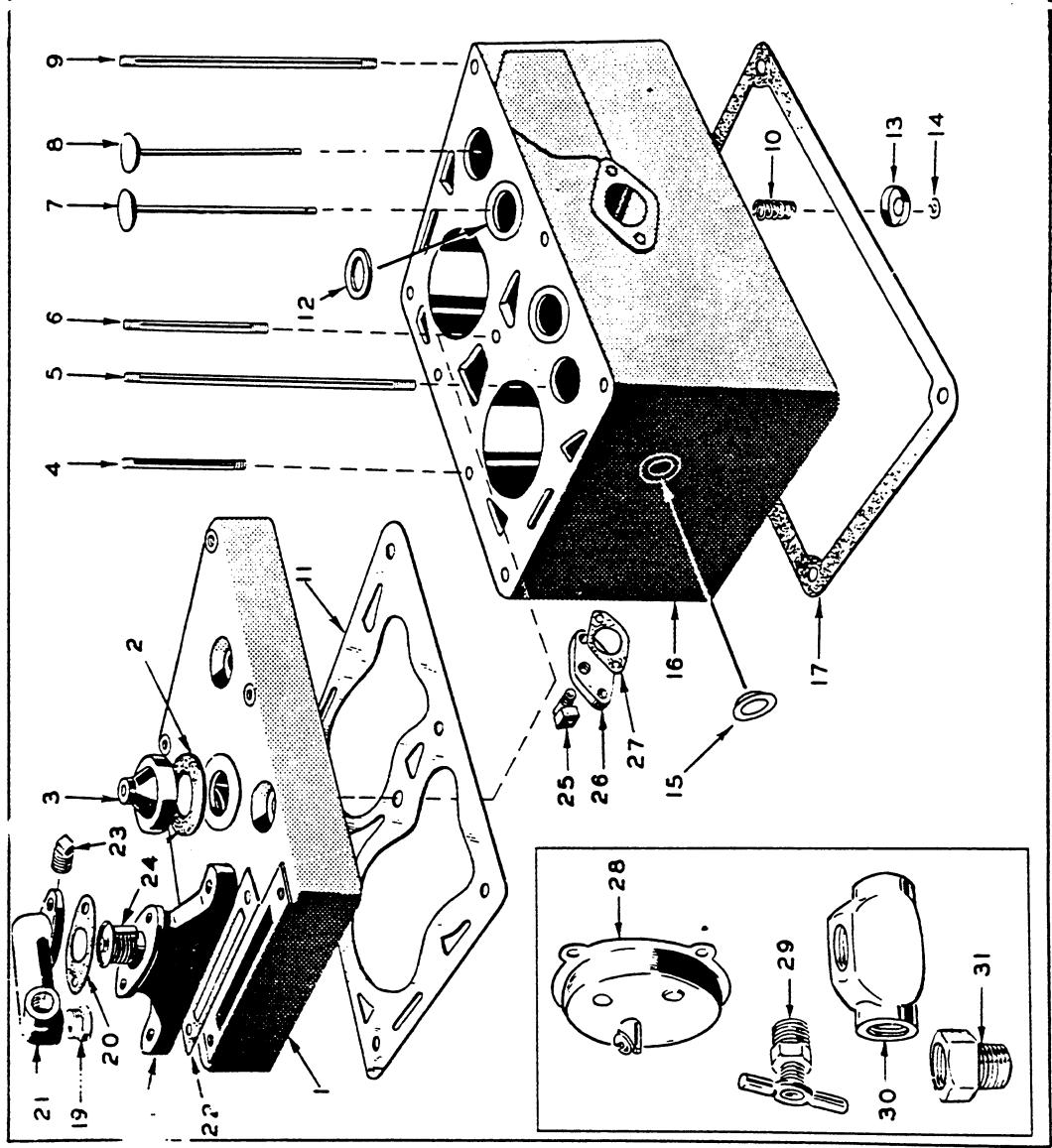


FIG. B - CYLINDER AND VALVE GROUP



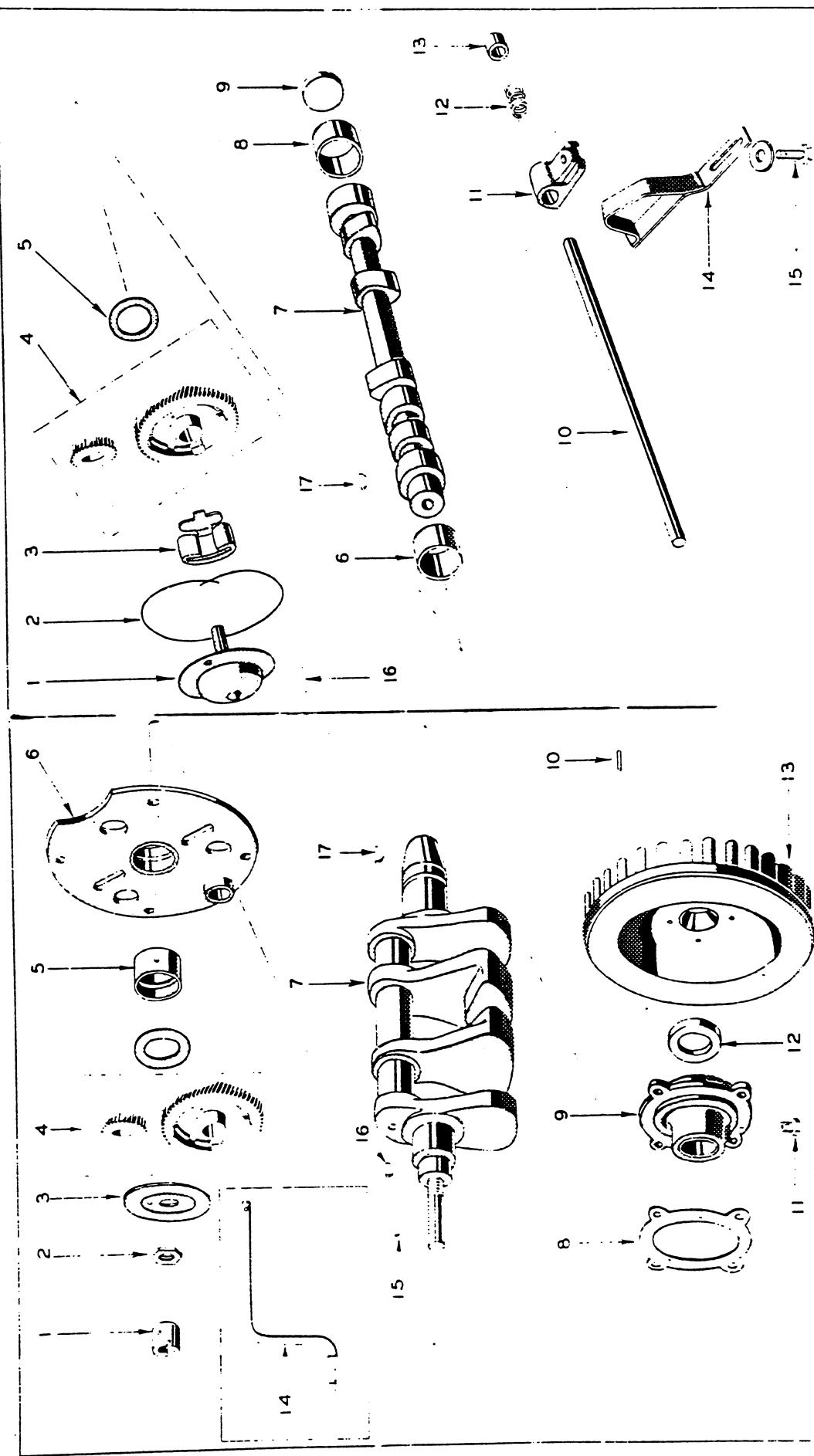


FIG. E-CAMSHAFT GROUP
FIG. D-CRANKSHAFT AND FLYWHEEL GROUP

FIG. G - GOVERNOR GROUP

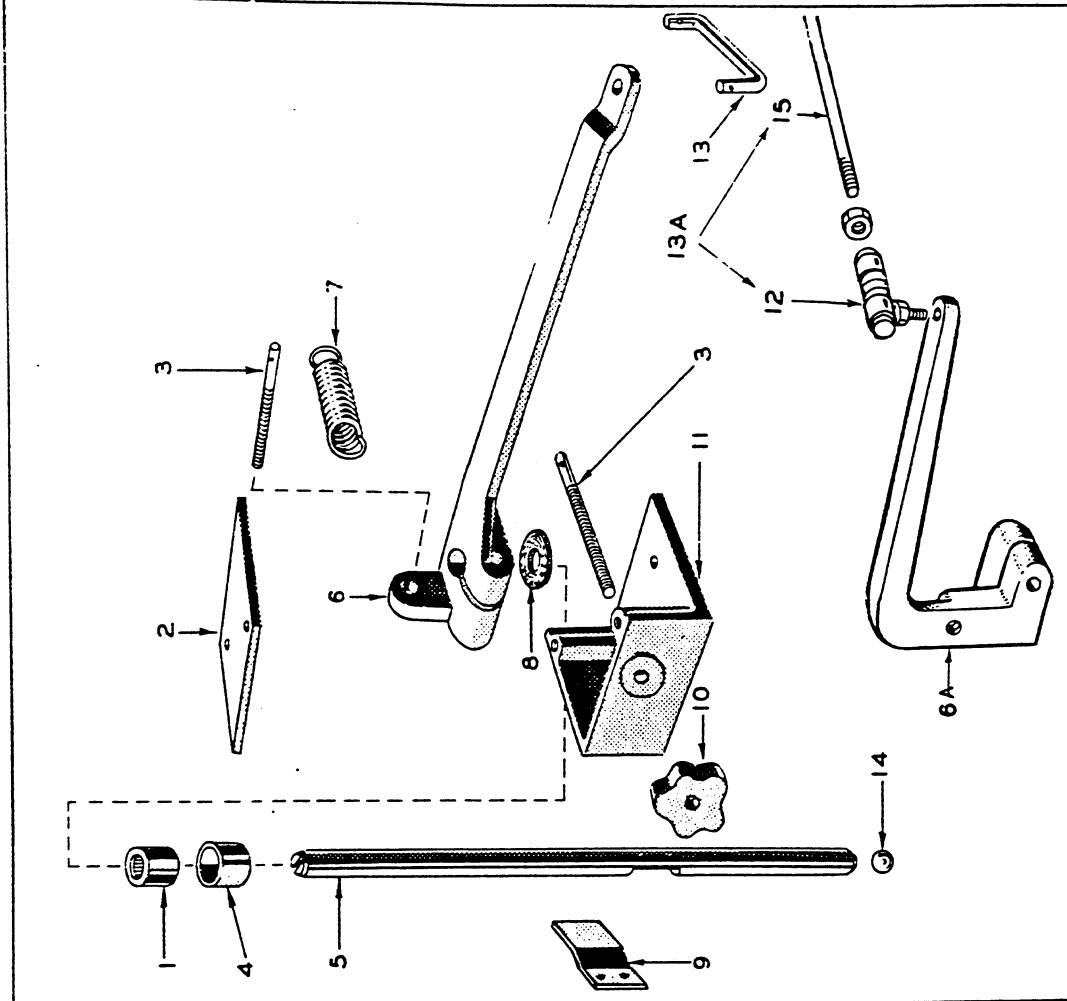
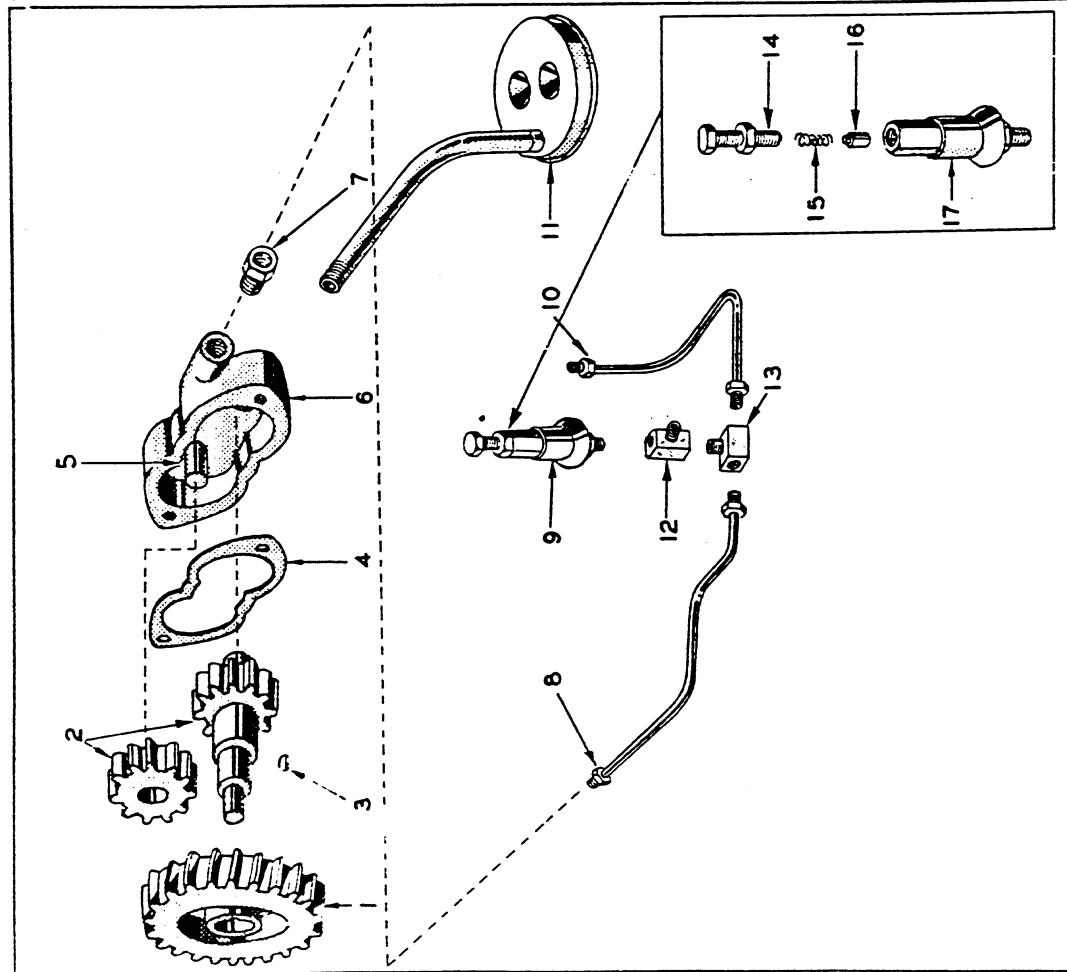


FIG. F - OIL PUMP GROUP



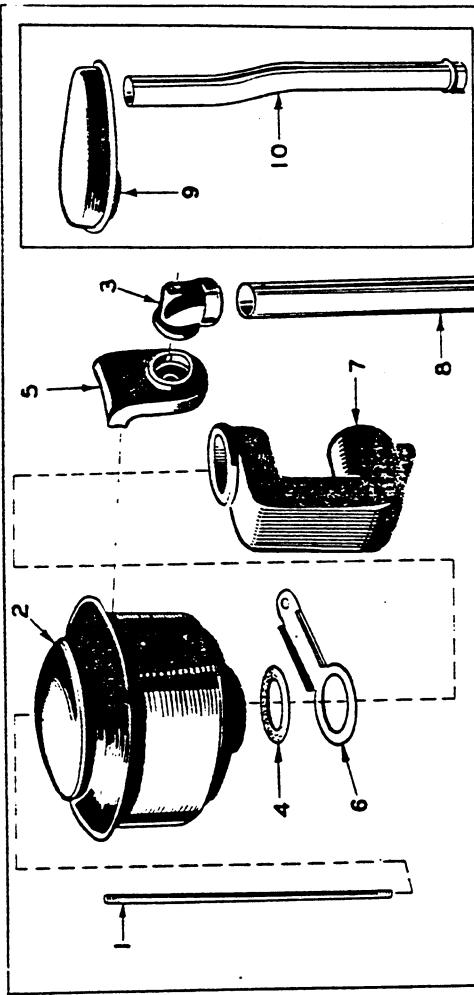


FIG. J - FLAME ARRESTER GROUP

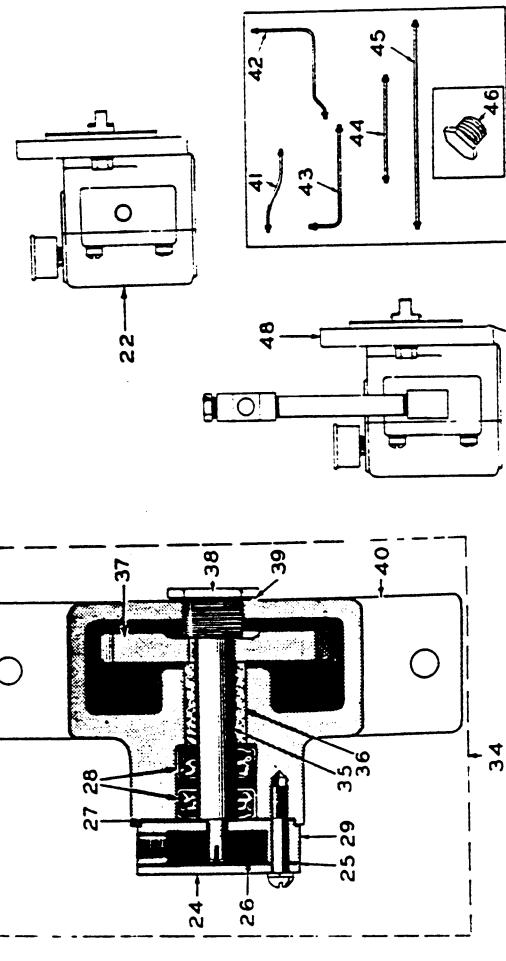


FIG. H - WATER PUMP GROUP

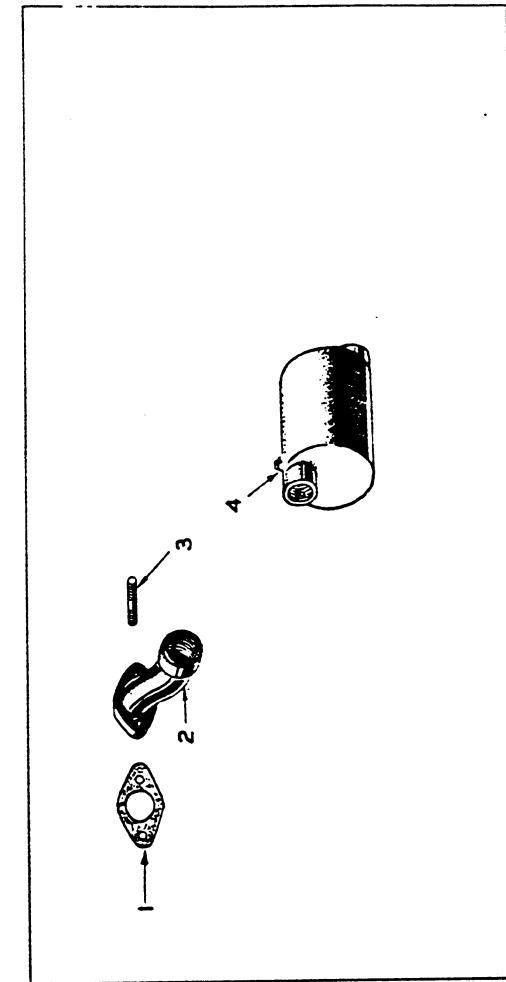


FIG. K - MUFFLER AND MANIFOLD GROUP

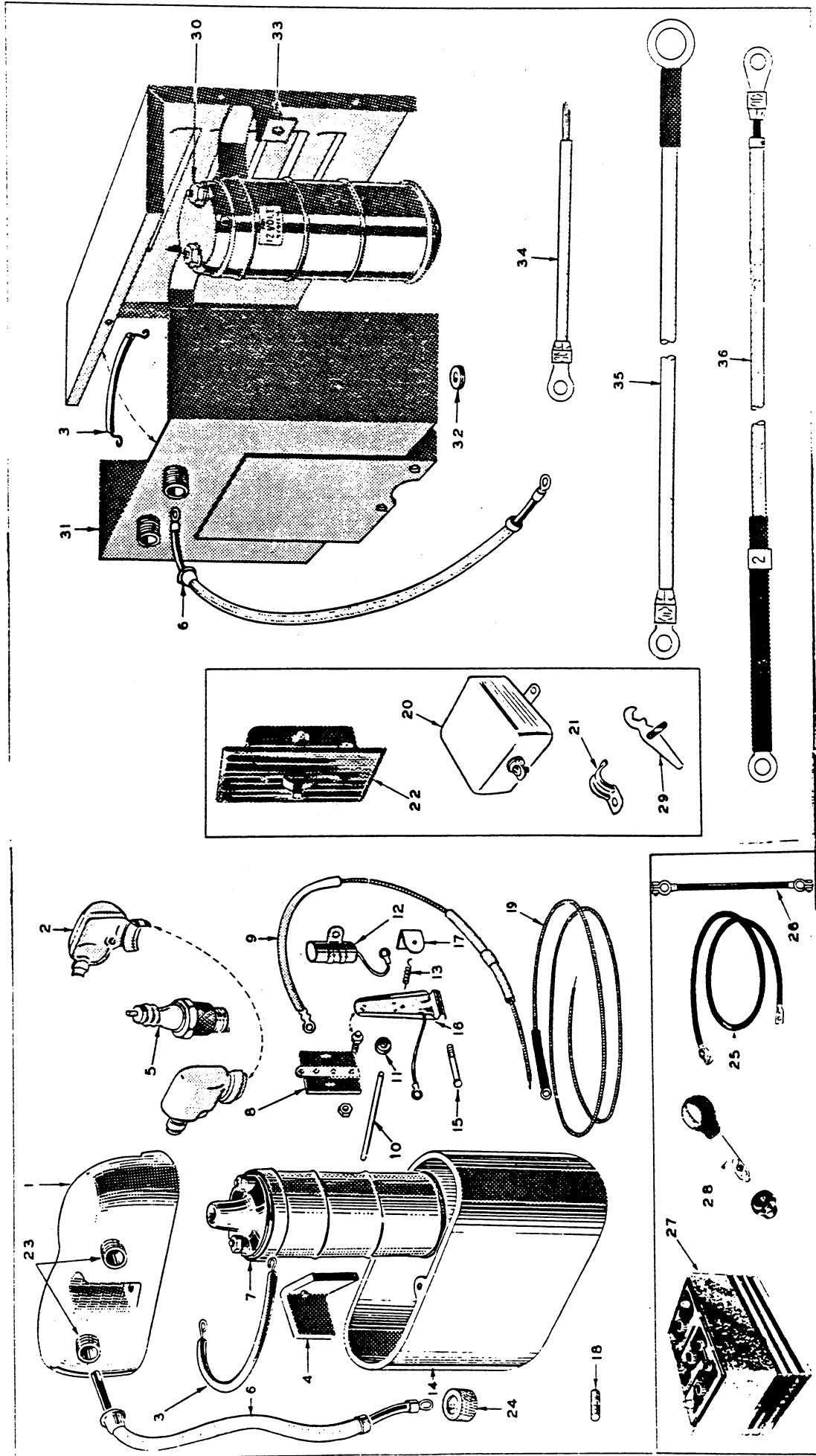


FIG. L-IGNITION GROUP-BATTERY

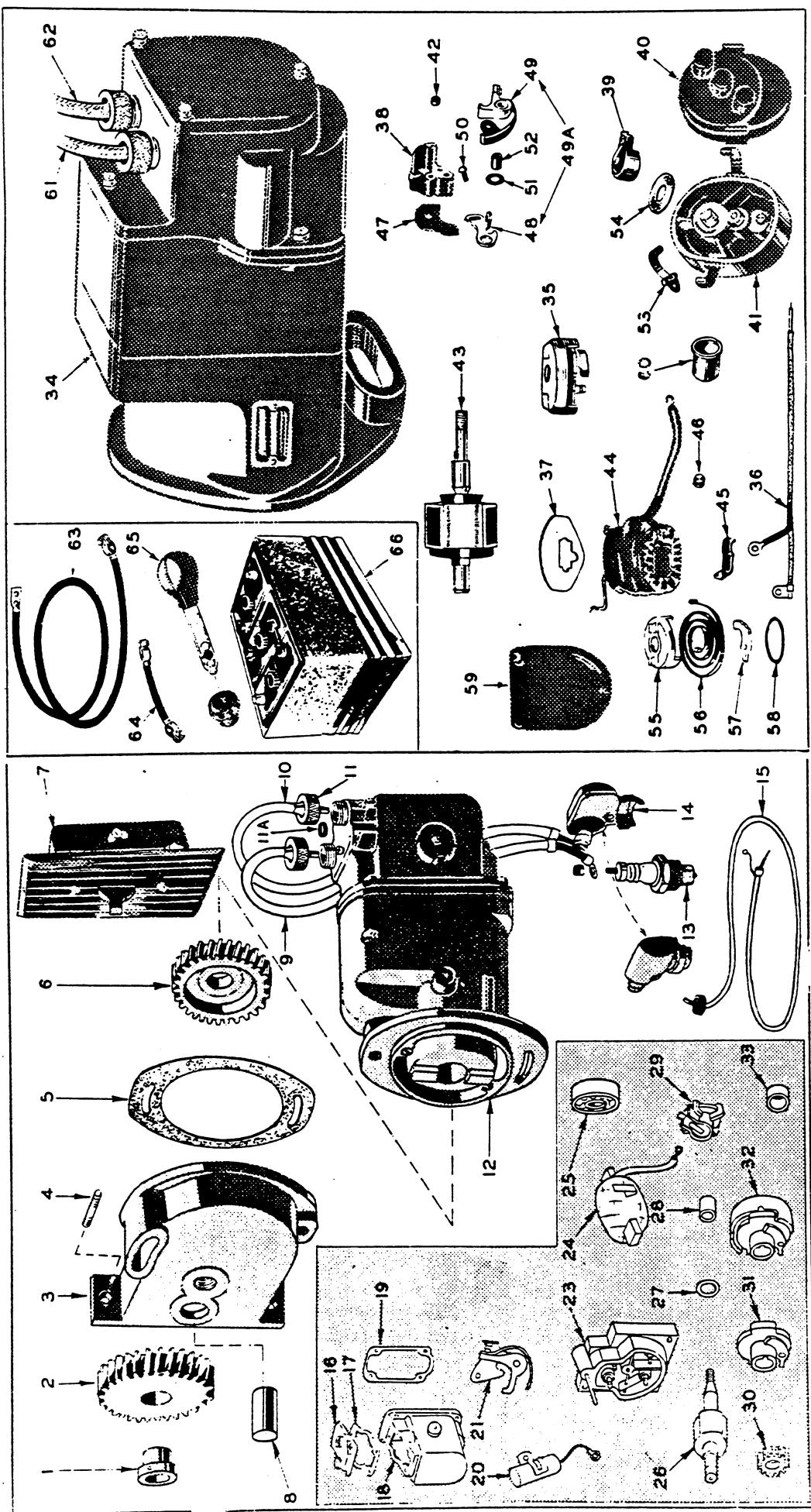


FIG. M - IGNITION GROUP-MAGNETO

FIG. O -CHOKE GROUP

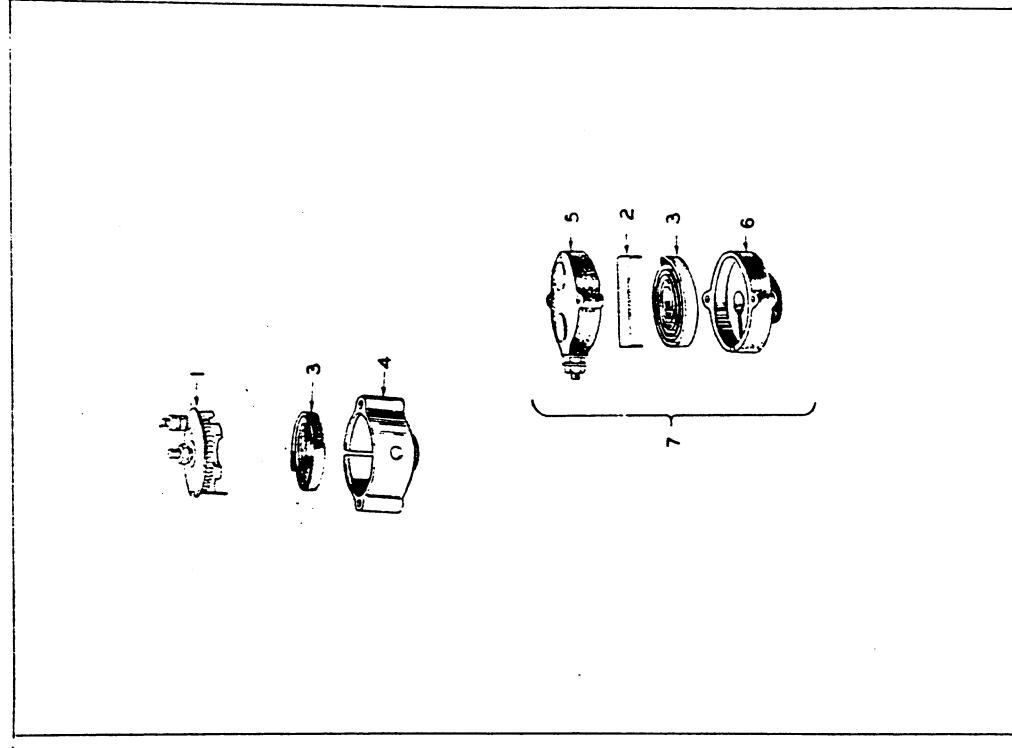
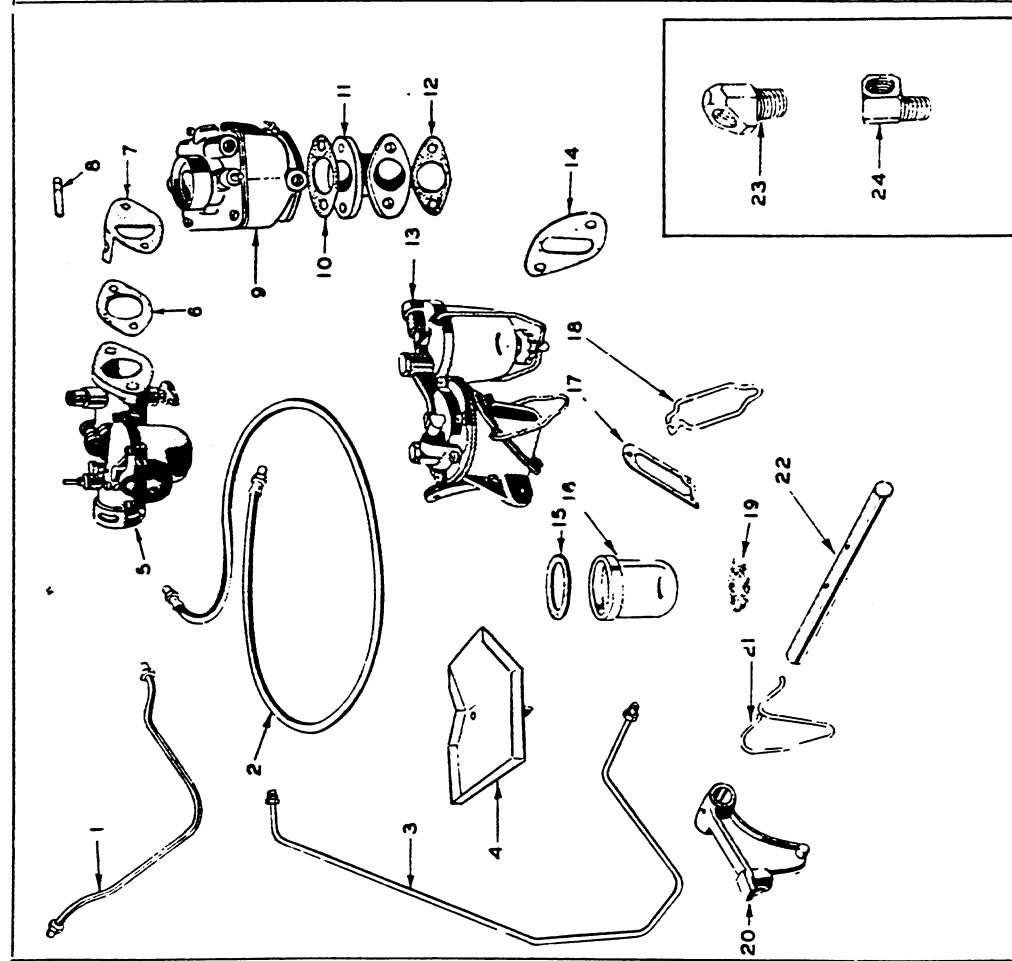


FIG. N -FUEL SYSTEM GROUP



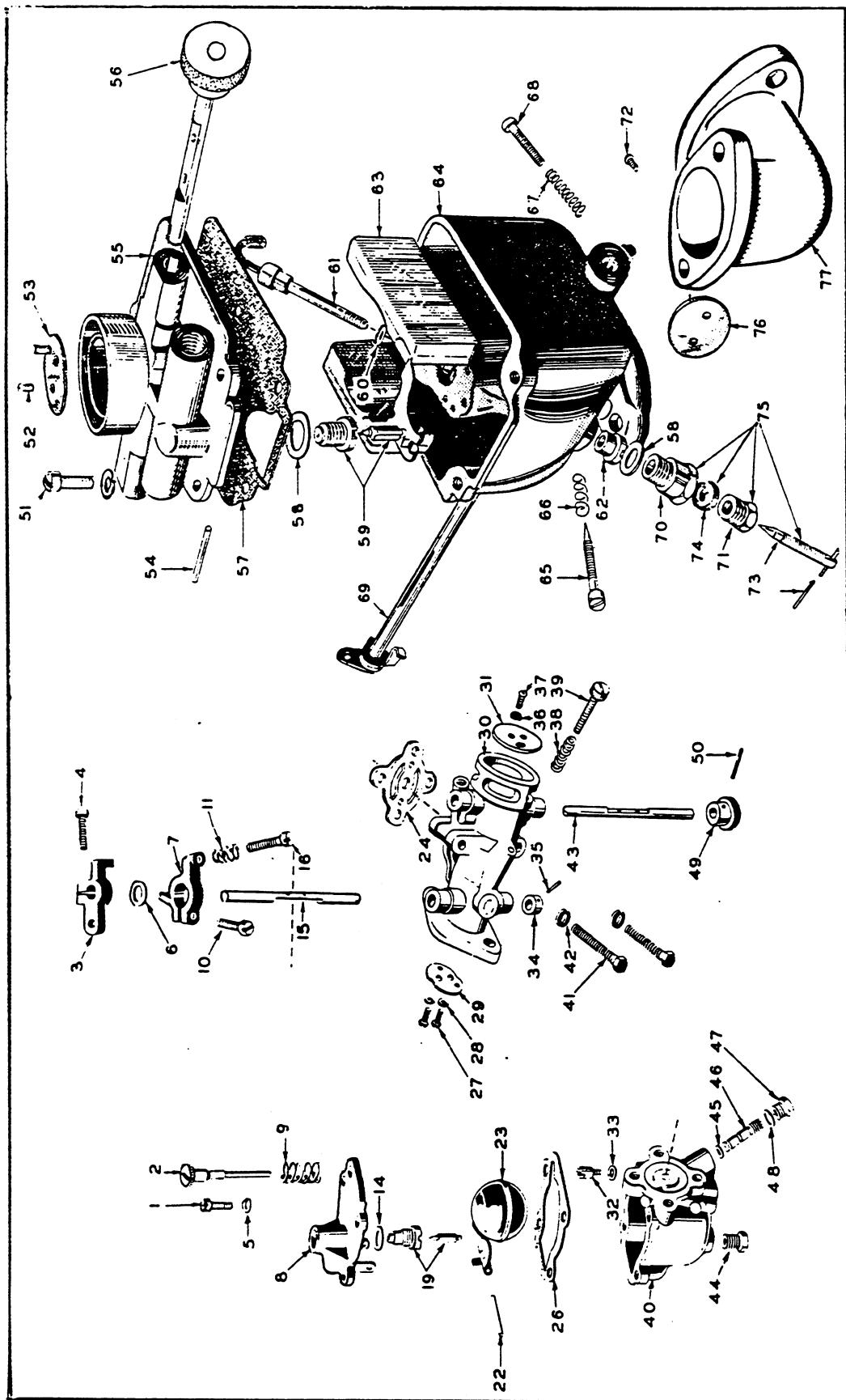


FIG. P - CARBURETOR PARTS GROUP

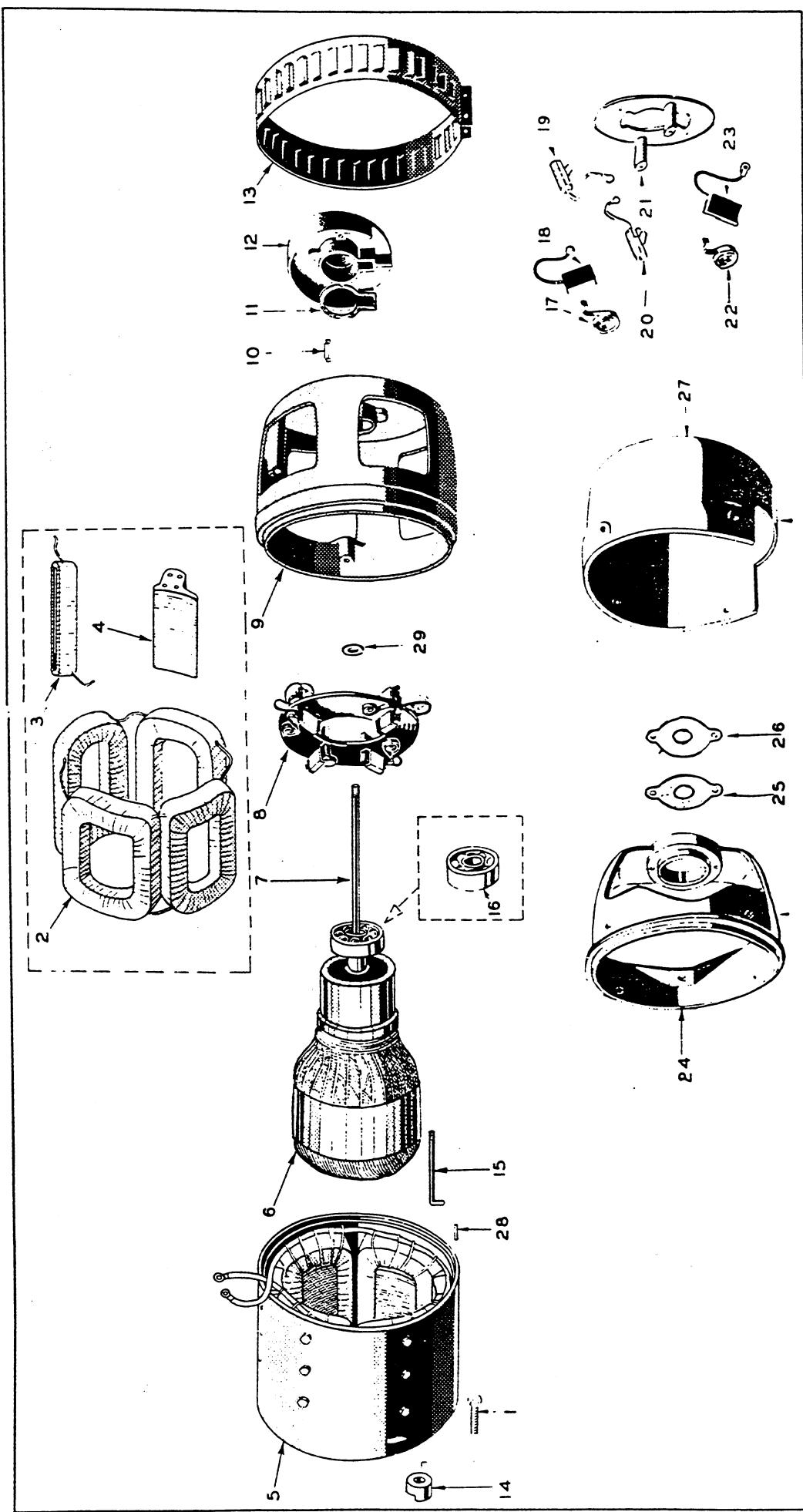
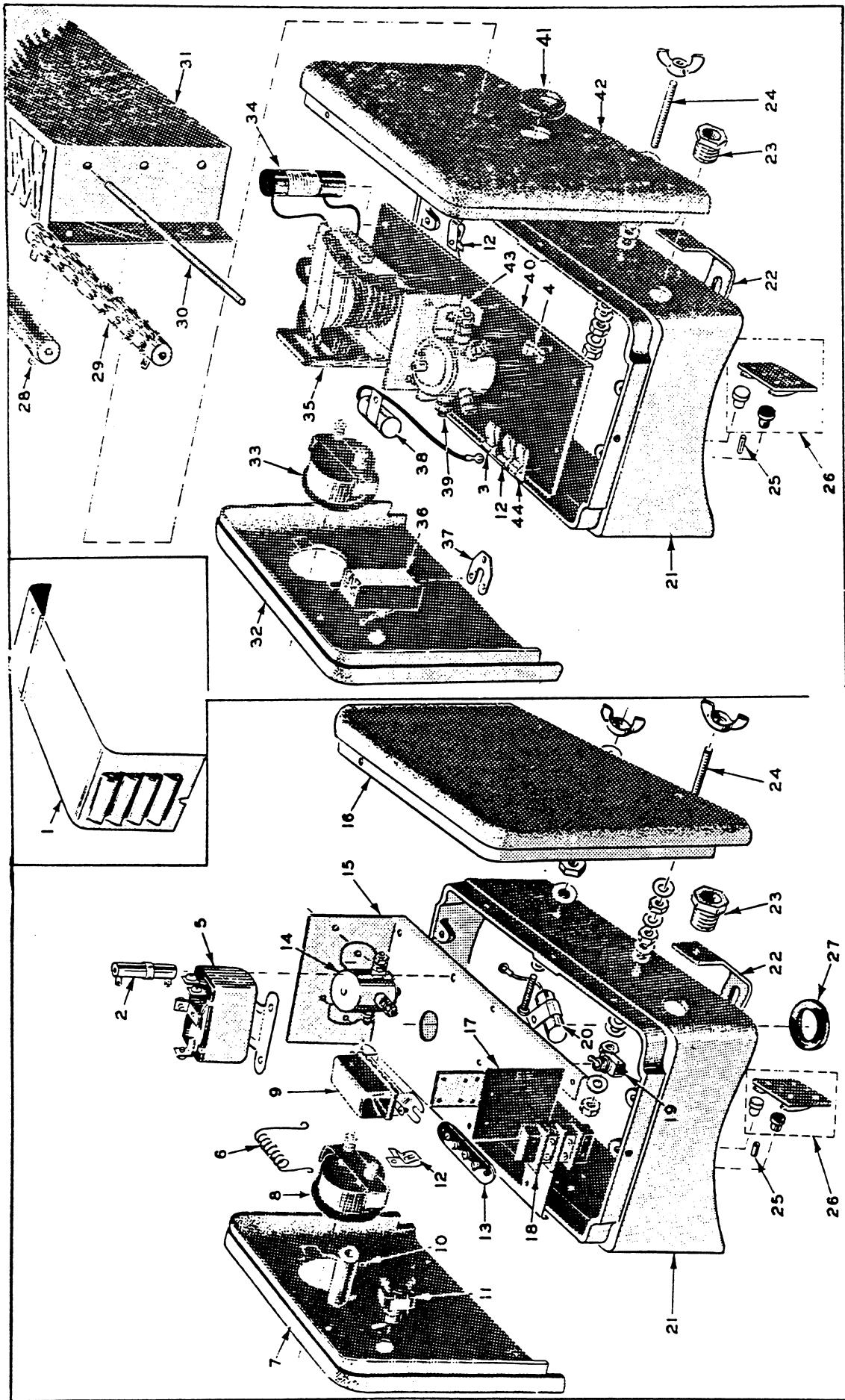


FIG. Q-GENERATOR GROUP



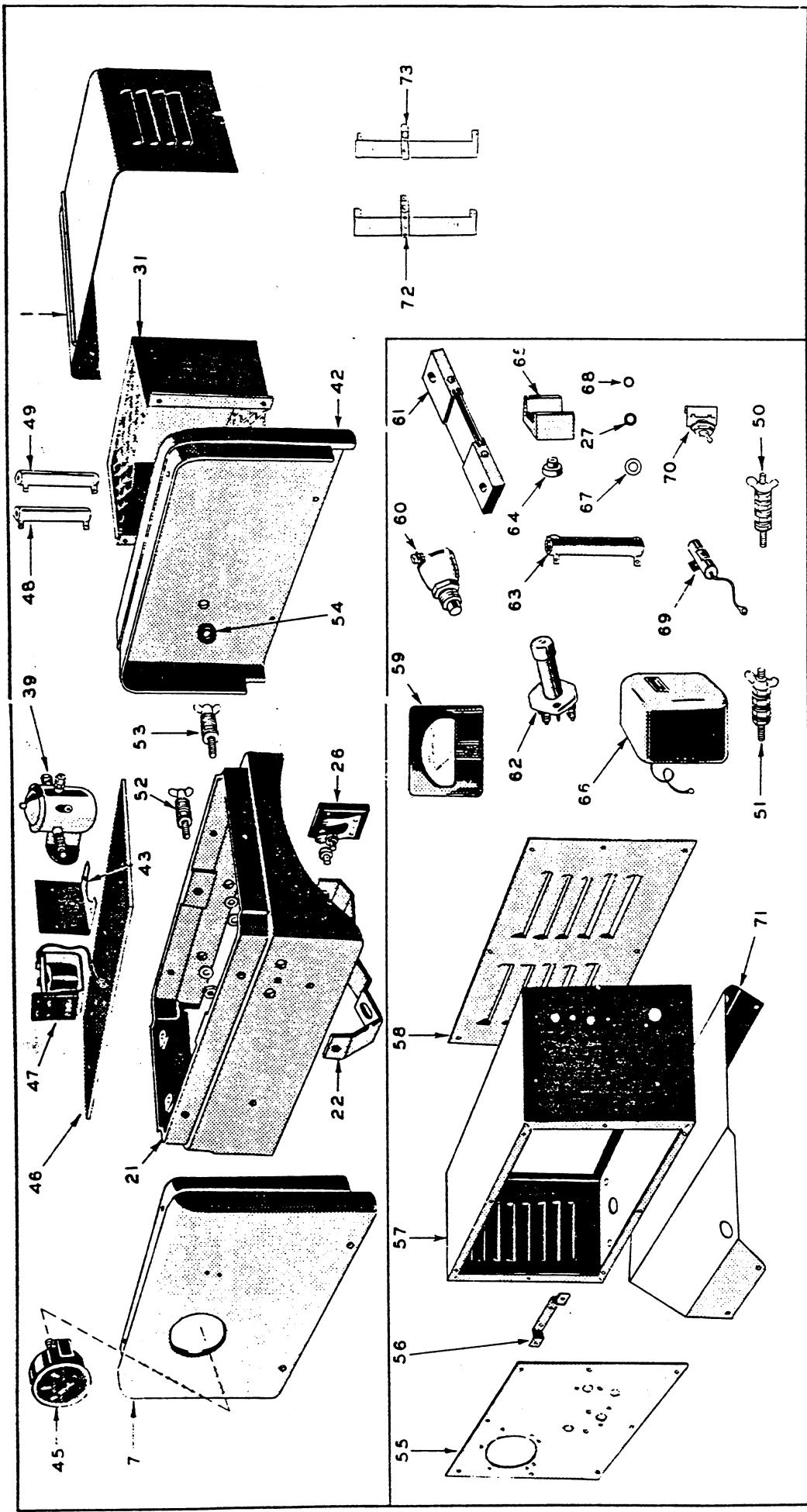


FIG.R -CONTROL GROUP

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
1	103C10	Cover, Gear	1	1	1	1	1
1	103A70	Cover Assembly, Gear - Includes Governor Shaft, Paddle, Oil Seal and Bearings	1	1	1	1	1
2	103B54	Gasket, Gear Cover	1	1	1	1	1
3	103A50	Gasket, Magneto or Water Pump Drive Flange	1	1	1	1	1
4	407C8	Support, Crank	1	1	1	1	1
5	12004CA	Crankcase - Includes Bearings - For Magneto Ignition	1	1	1	1	1
5	12004A	Crankcase - Includes Bearings - For Battery Ignition	1	1	1	1	1
6	101A90	Gasket, Valve Inspection Plate	1	1	1	1	1
7	101B21	Plate, Valve Inspection and Breaker	1	1	1	1	1
7	101B20	Plate, Valve Inspection	1	1	1	1	1
8	123A7	Cap, Crankcase Breather	1	1	1	1	1
9	516A10	Pin, Dowel - Generator Frame to Crankcase	1	1	1	1	1
10	123A18	Cap, Oil Filler - Includes Indicator and Gasket	1	1	1	1	1
11	123B38	Adapter, Crankcase Breather	1	1	1	1	1
12	516A1	Pin, Dowel - Gear Cover	2	2	2	2	2
13	101A89	Gasket, Crankcase Inspection Plate	1	1	1	1	1
14	166B23	Plate, Breaker Inspection - Use only with Gear Type Water Pump	1	1	1	1	1
14	12016	Plate, Breaker Inspection - Use only with Impeller Type Water Pump	1	1	1	1	1
15	101A91	Gasket, Crankcase Breather Adapter	1	1	1	1	1
16	102A51	Gasket, Oil Base	1	1	1	1	1
17	13218A	Plate, Crankcase Inspection - Includes Screen	1	1	1	1	1
18	123A8	Valve Assembly, Check - Crankcase Breather	1	1	1	1	1
19	509-59	Seal, Oil - Gear Cover (Replaces #12092)	1	1	1	1	1
20	12060	Base, Oil	1	1	1	1	1
21	193-6	Gauge, Oil Pressure (Replaces #193-33)	1	1	1	1	1
22	101B95	Plate, Oil Baffle	1	1	1	1	1
23	402A85	Dampener, Vibration	2	2	2	2	2
24	402A61	Dampener, Vibration	2	2	2	2	2
25	192A12	Bracket, Crank	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
26	520A91	Stud, 7/16 x 7-1/2" - Mounting Crank and Support Bracket	1	1	1	1	1
27	520A90	Stud, 7/16 x 4-3/4" - Mounting Crank and Support Bracket	2	2	2	2	2
28	520A315	Stud, Crank Support Mounting	1	1	1	1	1
29	505-13	Plug, Pipe - 1/2" - Oil Drain	1	1	1	1	1
30	505-2	Nipple, Pipe - 1/2" x 3" - Oil Drain	1	1	1	1	1
31	505-14	Coupling, Pipe - 1/2" - Oil Drain	1	1	1	1	1
32	505-104	Nipple, Pipe - 1/8" x 1-1/2" - Oil Pressure Gauge	1	1	1	1	1
33	505-45	Elbow, Pipe - 1/8" x 45° - Oil Pressure Gauge	1	1	1	1	1
	402K87	Kit, Vibration Dampener	1	1	1	1	1

FIG. A - CRANKCASE, OIL BASE AND GEAR COVER GROUP (Cont.)

FIG. B - CYLINDER AND VALVE GROUP

1	110A783	Head, Cylinder	1	1	1	1	1
2	110A291	Gasket, Cylinder Head Cap	1	1	1	1	1
3	2212	Cap, Cylinder Head	1	1	1	1	1
4	520A169	Stud, 7/16 x 2-11/16" - Mounting Cylinder Head	3	3	3	3	3
5	520A175	Stud, 7/16 x 7-7/8" - Mounting Cylinder Head and Block	2	2	2	2	2
6	520A172	Stud, 7/16 x 3-13/16" Mounting Cylinder Head	1	1	1	1	1
7	110A304	Valve, Exhaust	2	2	2	2	2
7	110A305	Valve, Exhaust - Stellite Faced	2	2	2	2	2
8	110A301	Valve, Intake	2	2	2	2	2
9	520A174	Stud, 7/16 x 7-1/8" - Mounting Cylinder Head and Block	2	2	2	2	2
10	110A310	Spring, Valve	4	4	4	4	4
11	110B297	Gasket, Cylinder Head	1	1	1	1	1
12	110A50	Seat, Exhaust Valve	2	2	2	2	2
12	110A12	Seat, Exhaust Valve - Stellite Faced (Replaces #110A306)	2	2	2	2	2
13	110A315	Washer, Retainer - Valve Spring	4	4	4	4	4

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

526-68 Wrench, Cylinder

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. B - CYLINDER AND VALVE GROUP (Cont.)							
14	110A311	Lock, Valve Spring	4	4	4	4	4
15	517-11	Plug, Welch - Cylinder Block	2	2	2	2	2
16	110D191	Block, Cylinder - Includes Studs, Tubes, Exhaust Valve Seats, and Welch Plugs	1	1	1	1	1
110-214		Block Assembly, Cylinder - Includes 110D191 plus all Valves completely assembled.	1	1	1	1	1
17	110B298	Gasket, Cylinder Base	1	1	1	1	1
18	130C65	Adapter, Cylinder Water	1	1	1	1	1
20	130A66	Gasket, Cylinder Water Outlet	1	1	1	1	1
21	130B179	Outlet, Cylinder Water	1	1	1	1	1
22	110A292	Gasket, Cylinder Water Outlet Adapter	1	1	1	1	1
23	505-110	Plug, Pipe - 1/8" - Cylinder Water Outlet	1	1	1	1	1
24	309B6	Thermostat	1	1	1	1	1
25	502-4	Elbow, Inverted Male - Cylinder Block	1	1	1	1	1
26	101A34	Plate, Water Inlet	1	1	1	1	1
27	110A293	Gasket, Water Inlet Plate	1	1	1	1	1
28	309-2	Switch, High Water Temperature Cut-off	1	1	1	1	1
29	504-3	Valve, Drain - Cylinder Block	1	1	1	1	1
30	502-61	Tee, Pipe	1	1	1	1	1
31	502-18	Connector, Inverted Male - Cylinder Water Connections	3	3	3	3	3
32	405A1067	Eye, Lifting	1	1	1	1	1
FIG. C - PISTON PIN AND CONNECTING ROD GROUP							
1	112A3	Ring, Lock - Piston Pin	4	4	4	4	4
2	112A10	Pin, Piston - Standard - Available in .005" Oversize	2	2	2	2	2
3	112-27	Piston, Standard - Includes Pin and Lock Rings - Available in .005", .010", .020", and .030" Oversize	2	2	2	2	2

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. C - PISTON PIN AND CONNECTING ROD GROUP (Cont)							
4	113-39	Ring Set - For one Piston - Standard - Available in .010", .020" and .030" Oversize	2	2	2	2	2
4	113A33	Ring, Compression - Standard (Top Two Rings) Available in .010", .020" and .030" Oversize	4	4	4	4	4
4	113A32	Ring, Compression - Standard (3rd Ring) Available in .010", .020" and .030" Oversize	2	2	2	2	2
4	113A31	Ring, Oil Control - Standard (Bottom Ring) Available in .010", .020" and .030" Oversize	2	2	2	2	2
4A	113-22	Ring Set - Expander Type - Includes 3 Standard Compression Rings and 1 Expander Type Oil Control	2	2	2	2	2
4A	113A17	Ring, Expander Type Oil	2	2	2	2	2
5	114-74	Rod, Connecting - Standard - Available in .020" Undersize	2	2	2	2	2
6	114A22	Screw, Connecting Rod Cap	4	4	4	4	4

FIG. D - CRANKSHAFT AND FLYWHEEL GROUP

1	104A62	Dog, Crank	1	1	1	1	1
2	104A107	Nut, Lock - Crankshaft Gear	1	1	1	1	1
3	104A106	Washer, Crankshaft Gear	1	1	1	1	1
4	105-73	Gear Set, Timing - Includes Crank and Cam Gears	1	1	1	1	1
5	101B96	Bearing, Crankshaft Main - Standard - Front and Rear - Available in .020" Undersize	1	1	1	1	1
6	$\frac{1}{16} - 2\frac{1}{8}$	Plate, Front Main Bearing - Includes Bearing	1	1	1	1	1
7	104D82	Crankshaft	1	1	1	1	1
8	101A87	Gasket, Rear Main Bearing Plate	1	1	1	1	1
9	$10\frac{1}{2} - 2\frac{1}{8}$	Plate, Rear Main Bearing - Includes Bearing	1	1	1	1	1
10	516A10	Pin, Flywheel Dowel	4	4	4	4	4
11	502-3	Connector, Inverted Male (1) Front, (1) Rear Bearing Plate	2	2	2	2	2

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. D - CRANKSHAFT AND FLYWHEEL GROUP (Cont.)							
12	12009	Seal, Oil - Rear Main Bearing Plate	1	1	1	1	1
13	12561X	Flywheel	1	1	1	1	1
14	192A28	Crank, Hand	1	1	1	1	1
15	515-2	Key, Woodruff - No. 9 - Crank Dog	1	1	1	1	1
16	515-98	Key, Woodruff - No. 61 - Crankshaft Gear	1	1	1	1	1
17	515-6	Key, Woodruff - No. A - Flywheel	1	1	1	1	1

FIG. E - CAMSHAFT GROUP

1	1041A	Cup and Stud Assembly, Governor	1	1	1	1	1
2	549	Wire, Retaining - Governor Weight	1	1	1	1	1
3	2084	Weight, Governor - 60 Cycle Plants	4	4	4	4	4
4	105-73	Gear Set, Timing - Includes Crank and Cam Gears (No Governor Weights)	1	1	1	1	1
5	526A89	Washer, Spacer - Camshaft Gear	1	1	1	1	1
6	101A103	Bearing, Camshaft - Front	1	1	1	1	1
7	12050	Camshaft	1	1	1	1	1
7	12050B	Camshaft	1	1	1	1	1
7	12050C	Camshaft	1	1	1	1	1
8	101A99	Bearing, Camshaft - Rear	1	1	1	1	1
9	517-27	Plug, Hubbard - Camshaft	1	1	1	1	1
10	2015	Shaft, Valve Lifter	1	1	1	1	1
11	758	Bearing, Valve Lifter	4	4	4	4	4
12	528	Spring, Spacer - Valve Lifter Bearing	2	2	2	2	2
13	2016	Bushing, Spacer - Valve Lifter Bearing	2	2	2	2	2
14	760A	Lifter, Valve - Less Bearing	4	4	4	4	4
	757A	Lifter Assembly, Valve - Includes Lifter and Bearing	4	4	4	4	4

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. E - CAMSHAFT GROUP (Cont.)							
15	115A24	Screw, Lock - Valve Lifter	4	4	4	4	4
16	516-71	Pin, Governor Cup	1	1	1	1	1
17	515-2	Key, Woodruff - No. 9 - Camshaft Gear	1	1	1	1	1
FIG. F - OIL PUMP GROUP							
C/2277							
Plate Assembly, Oil Pump and Bearing - Includes Driver and Driven Gears, Body Idler Shaft, Drive Shaft, Body Gasket, Connector, Bearing Plate and Bearing							
/20-328		Pump Assembly, Oil - Includes Driver and Driven Gears, Idler Shaft, Drive Shaft, Body and Body Gasket ... (C/2277.C)	1	1	1	1	1
1	12081B	Gear, Drive	1	1	1	1	1
2	120-251	Gear Set - Includes Drive Shaft, Driver and Driven Gears	1	1	1	1	1
3	515-92	Key, Woodruff - #2 - Drive Gear	1	1	1	1	1
4	120K162	Kit, Gasket - Oil Pump Body	1	1	1	1	1
5	12082	Shaft, Driven Gear - Sold only as part of 12080A	1	1	1	1	1
6	12080A	Body, Oil Pump - Includes Idler Gear Shaft	1	1	1	1	1
7	502-3	Connector, Inverted Male - Oil Pump	1	1	1	1	1
8	120A126	Line, Oil - Pump to Tee	1	1	1	1	1
9	/20-330	By-Pass Assembly, Oil Pump (Specify "Factory Adj. to Correct Pressure").	1	1	1	1	1
10	120A127	Line, Oil - Rear Bearing Plate to Tee	1	1	1	1	1
11	120A69	Cup, Oil Intake - Includes Pipe and Screen	1	1	1	1	1
12	502-45	Tee, Inverted	1	1	1	1	1
13	502-57	Tee, Pipe	1	1	1	1	1
14	12276	Screw and Nut, By-Pass Adjusting	1	1	1	1	1
15	120A101	Spring, Oil By-Pass	1	1	1	1	1
16	120A12	Valve, Plunger	1	1	1	1	1
17	12273C	Body and Cup Assembly, By-Pass	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

REF.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. G - GOVERNOR GROUP							
1	510-53	Bearing, Needle - Governor Shaft (Replaces #12137B)	2	2	2	2	2
2	12189	Cover, Spring - Used only with Zenith Carburetor	1	1	1	1	1
2	150B54	Cover, Governor Arm - Used only with Marvel Schebler Carburetor	1	1	1	1	1
3	150A150	Stud, Sensitivity Adj.	2	2	2	2	2
4	150-527	Bushing, Upper Needle Bearing - Governor Shaft (Replaces #12196)	1	1	1	1	1
5	150A48	Shaft, Governor	1	1	1	1	1
6	12180	Arm, Governor - Used only with Zenith Carburetor	1	1	1	1	1
6	12180A	Arm Assembly, Governor - Includes Arm Adj. Screws, Spring and Cover - Used only with Zenith Carburetor	1	1	1	1	1
6A	150B53	Arm, Governor - Used only with Marvel Schebler Carburetor	1	1	1	1	1
7	12190	Spring, Governor	1	1	1	1	1
8	509-29	Washer, Felt - Governor Shaft	1	1	1	1	1
9	150A87	Paddle, Governor Shaft	1	1	1	1	1
10	150A61	Knob, Governor Adjusting	1	1	1	1	1
11	12187	Bracket, Speed Adjusting	1	1	1	1	1
12	150A639	Joint, Ball	2	2	2	2	2
13	12115	Link, Connecting - Governor Arm to Carburetor - Used only with Zenith Carburetor	1	1	1	1	1
13A	150B65	Link, Connecting - Governor Arm to Carburetor - Used only with Marvel Schebler Carburetor	1	1	1	1	1
14	510-43	Bearing, Ball - 5/16" - Governor Shaft	1	1	1	1	1
15	520A321	Stud, Governor Linkage	1	1	1	1	1

FIG. H - WATER PUMP GROUP

1	160A106	Gear, Idler - Used with Gear Type Pump and Battery Ignition and all units with Magneto Ignition	1	1	1	1
2	12110	Shaft, Idler Gear - Used with Gear Type Pump and Battery Ignition and all units with Magneto Ignition	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

47

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
3	12109	Bushing, Idler Gear - Used with Gear Type Pump and Battery Ignition and all units with Magneto Ignition	1	1	1	1	1
4	131A16	Shaft, Drive - Used with Gear Type Pump and Battery Ignition and all units with Magneto Ignition	1	1	1	1	1
5	131A17	Bearing, Drive Shaft - Used with Gear Type Pump and Battery Ignition and all units with Magneto Ignition	1	1	1	1	1
6	131C19	Adapter, Water Pump	1	1	1	1	1
7	131A7	Gear, Water Pump Drive - Used only with Gear Type Pump and Battery Ignition	1	1	1	1	1
8	131A21	Collar, Water Pump Drive - Used only with Gear Type Pump	1	1	1	1	1
9	131A23	Washer, Thrust - Used only with Gear Type Pump	1	1	1	1	1
10	103B20	Cover, Gearcase - Used only with Gear Type Pump and Battery Ignition	1	1	1	1	1
11	131A20	Spring, Spacer - Used only with Gear Type Pump and Battery Ignition	1	1	1	1	1
12	151A12	Gasket, Water Pump Adapter - Used with Gear Type Pump and Battery Ignition and all units with Magneto Ignition	1	1	1	1	1
13	103C15	Gearcase, Magneto or Water Pump Drive - Used with Gear Type Pump and all units with Magneto Ignition	1	1	1	1	1
14	509-14	Seal, Oil - Drive Shaft - Used only with Gear Type Pump	1	1	1	1	1
15	502-4	Elbow, Inverted Male (1) Gear Type Pump (3) Impeller Type Pump	1	1	1	1	1
16	502-20	Elbow, Street - Inlet - Used only with Gear Type Pump	1	1	1	1	1
17	502-78	Nipple, Pipe Inlet - Used only with Gear Type Pump	1	1	1	1	1
18	502-79	Tee, Pipe - Inlet - Used only with Gear Type Pump	1	1	1	1	1
19	502-28	Plug, Pipe - 1/8" - Inlet - Used only with Gear Type Pump	1	1	1	1	1
20	132-30	Gear and Shaft Assembly, Driver - For Gear Type Pump	1	1	1	1	1
21	132-31	Gear and Shaft Assembly, Driven - For Gear Type Pump	1	1	1	1	1
23	131B56	Pump and Adapter Assembly, Water - Impeller Type (Replaces Gear Type Pump #132B22)	1	1	1	1	1
24	131A42	Cover, Water Pump - For Impeller Type Pump	1	1	1	1	1
25	131A44	Gasket, Water Pump Cover - For Impeller Type Pump	1	1	1	1	1
26	131-50	Impeller, Rubber - For Impeller Type Pump	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. H - WATER PUMP GROUP (Cont.)							
27	131A43	Gasket, Water Pump - For Impeller Type Pump	1	1	1	1	1
28	509-44	Seal, Oil - For Impeller Type Pump Shaft (Replaces #509-34)	2	1	2	1	1
29	131B45	Body, Water Pump - For Impeller Type Pump	1	1	1	1	1
30	131A54	Shaft, Drive - Used only with Impeller Type Pump #131B56	1	1	1	1	1
31	131B55	Adapter, Water Pump - Used only with Impeller Type Pump and Magneto Ignition	1	1	1	1	1
32	510-39	Bearing, Drive Shaft - Used only with Impeller Type Pump and Magneto Ignition	1	1	1	1	1
33	509-35	"O" Ring - Used only with Impeller Type Pump and Magneto Ignition	1	1	1	1	1
34	131C46	Pump and Gear Box Assembly, Water Impeller Type - Battery Ignition	1	1	1	1	1
35	131A47	Shaft, Drive - Used only with Impeller Type Pump and Battery Ignition	1	1	1	1	1
36	131A51	Bearing, Bronze - Used only with Impeller Type Pump and Battery Ignition. Gear, Water Pump Drive - Used only with Impeller Type Pump and Battery Ignition	1	1	1	1	1
37	131A49	Plug, Screw - Used only with Impeller with Impeller Type Pump and Battery Ignition	1	1	1	1	1
38	131A41	Gasket, Screw Plug - Used only with Impeller Type Pump and Battery Ignition	1	1	1	1	1
39	131A35	Box, Gear - Used only with Impeller Type Pump and Battery Ignition	1	1	1	1	1
40	131C48	Line, Water - Tee to Cylinder Water Outlet	1	1	1	1	1
41	131A31	Line, Water - Pump to Tee - Used only with Gear Type Pump	1	1	1	1	1
42	131C30	Line, Water - Tee to Cylinder Block	1	1	1	1	1
43	131A32	Tube Assembly, Water - Pump to Tee - Used only with Impeller Type Pump and Battery Ignition	1	1	1	1	1
44	131A57	Tube Assembly, Water - Pump to Tee - Used only with Impeller Type Pump and Magneto Ignition	1	1	1	1	1
45	131A60	Plug, Screw - Used only with Gear Type Pump and Battery Ignition	1	1	1	1	1
46	131A33	Pump and Gear Box Assembly, Water - Gear Type - Includes 132B33	1	1	1	1	1
47	132C21	Pump Assembly, Water - With Primer Fittings - Includes 132B22 - Use Kit #131K69	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

49

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
131K69	Klt, Water Pump - For Replacement	Pump and Gear Box Assembly, Water - Used on Models with Impeller Type and Magneto Ignition	1	1	1	1	1
131C73			1	1	1	1	1

FIG. H - WATER PUMP GROUP (Cont.)

FIG. J - FLAME ARRESTER GROUP

1	520A208	Stud, Flame Arrestor - Use with 140B173 Cleaner	1	1	1	1	1
2	140B173	Air Cleaner and Flame Arrestor - Oil Bath	1	1	1	1	1
3	13229	Adapter, Vapor Trap - Use with 140B173 Cleaner	1	1	1	1	1
4	140A96	Gasket, Flame Arrestor - Use with 140B173 Cleaner	1	1	1	1	1
5	123A53	Breather, Vapor Trap - Use with 140B173 Cleaner	1	1	1	1	1
6	12159	Support, Flame Arrestor - Use with 140B173 Cleaner	1	1	1	1	1
7	12945	Adapter, Flame Arrestor - Use with 140B173 Cleaner	1	1	1	1	1
8	13226	Tube, Breather - Use with 140B173 Cleaner	1	1	1	1	1
9	140B41	Arrestor, Flame - Tear Drop	1	1	1	1	1
10	123A270	Tube Assembly, Breather - Used only with Tear Drop Flame Arrestor 140B41	1	1	1	1	1

FIG. K - MUFFLER GROUP

1	154A49	Gasket, Exhaust Outlet	1	1	1	1	1
2	155-469	Outlet, Exhaust	1	1	1	1	1
3	520A223	Stud - 5/16" x 1-1/4" - Mounting Exhaust Outlet	2	2	2	2	2
4	155-84	Muffler, Exhaust	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. L - IGNITION GROUP BATTERY							
1	166A151	Cover, Coil Box (Replaces #166B42)	1	2	2		
2	167-41	Shield Assembly, Spark Plug		2			
3	336A724	Juniper, Coil		1			
4	166A95	Clamp, Coil Mounting		1			
5	167-34	Plug, Spark		2			
6	167A1082	Cable Assembly, Spark Plug (Used when coil box mounts on block)		2			
6	12405A	Cable Assembly, Spark Plug		2			
6	167A1299	Cable Assembly, Spark Plug (Used when coil box mounts on Control Box) and Replaces #167A1106)		2			
7	166B91	Coil, Ignition - 6 Volt		2			
8	166-72	Block, Insulating - Contact Point		1	1		
9	336A375	Lead, Breaker Box to Coil ($\frac{1}{2}$, $\frac{1}{8}$, $\frac{1}{16}$)		1			
10	/66-239	Plunger, Breaker		1			
11	509A24	Seal, Oil - Ignition Breaker Plunger		2			
12	312A59	Condenser, Ignition - .25 Mfd. (Replaces #312A3)		1	1		
13	/66-238	Spring, Breaker Arm . $\frac{1}{2}$, $\frac{1}{16}$, $\frac{1}{32}$		1	1		
14	166A152	Box, Ignition Coil - Mounts on Engine Block (Replaces #166C58)		1			
15	160A140	Stud, Breaker Arm		1			
16	/66-476	Point Set, Ignition . $\frac{1}{4}$, $\frac{3}{32}$, $\frac{7}{64}$		1	1	1	
17	/66-110	Bracket, Breaker Spring . $\frac{1}{2}$, $\frac{1}{16}$, $\frac{1}{32}$		1			
18	520A222	Stud - Coil Box to Block		2			
19	226A99	Lead, Ignition Coil Primary - Coil Box Mounted on Control Box		1			
19	226A204	Lead, Ignition Coil Primary - Coil Box Mounted on Engine Block		1			
20	314A26	Filter, Ignition		1			
21	167A33	Clip, Cable		1			
22	308A165	Switch Assembly, Remote Start-Stop (Replaces #308-40 or #308A94)		1			
23	167A1	Nipple, Coil Box Cover		2			
24	167A57	Nut, Spark Plug Cable Knurled (Replaces #167A2)		2			
25	416A77	Cable, Battery - Negative and Positive		2			

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

51

REF.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
26	416A4	Cable, Battery Jumper	1				
	336A14	Lead, Ignition Coil Primary - Coil Box Mounted in Control Box	1				
27	416A73	Battery, 6 Volt	2				
28	416-89	Hydrometer, Battery	1				
29	417-53	Wrench, Breaker Point	1				
30	18849	Coil, Ignition - 12 Volt	2				
31	166A126	Box, Ignition Coil - Includes Cover	1				
32	508-2	Grommet, Rubber 3/8"	1				
33	166A22	Strap, Ignition Coil	1				
34	336A224	Lead, Filter to Coil	1				
35	336A318	Lead	1				
36	336A223	Lead Assembly, Primary	2				

FIG. L - IGNITION GROUP BATTERY (Cont.)							
.....							

FIG. M - IGNITION GROUP MAGNETO							
.....							

1	12109	Bushing, Idler Gear	1				
2	160A106	Gear, Magneto Drive Idler	1				
3	103C15	Gearcase, Magneto Drive	1				
4	520A236	Stud, Magneto Drive Gearcase	1				
5	160A124	Gasket, Magneto Flange	2				
6	12097	Gear, Magneto Drive	1				
7	308A94	Switch, Assembly - Remote Start-Stop (Replaces #308-40)	1				
8	12110	Shaft, Magneto Idler Gear	1				
9	167A1001	Cable Assembly, Spark Plug - No. 1 used only with F. M. Magneto	1				
10	167A1002	Cable Assembly, Spark Plug - No. 2 used only with F. M. Magneto	1				
11	167A57	Nut, Spark Plug Cable Knurled (Replaces #167A2)	2				
11A	167-19	Seal, High Tension Lead	2				

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

REF.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
12	/6/-/59	Magneto - Fairbanks Morse - Use Magneto /6/K/95 For Replacement	1	1	1	1	1
13	167-34	Plug, Spark	2	2	2	2	2
14	167-41	Shield Assembly, Spark Plug	2	2	2	2	2
15	336A402	Lead, Magneto to Control Panel	1	1	1	1	1
16	161-7	Cover, End Cap - F. M.	1	1	1	1	1
17	161-6	Gasket, End Cap Cover - F. M.	1	1	1	1	1
18	161-22	Cap, End - Includes Ground Cable Outlet, Hooded and Ventilated Screen - F. M.	1	1	1	1	1
19	161-42	Gasket, End Cap Mounting - F. M.	1	1	1	1	1
20	161-25	Condenser Assembly - Includes Lead Wire and Terminal - F. M.	1	1	1	1	1
21	161-28	Point Set - Includes Stationary Bracket, Spring and Point - F. M.	1	1	1	1	1
23	161-39	Outlet, Cable - Includes Inserts and Hi-Tension Lead Assembly - F. M.	1	1	1	1	1
24	161-29	Coil Assembly - Includes Primary Lead and Terminal - F. M.	1	1	1	1	1
25	161-71	Bearing, Ball - Rotor Drive End - F. M.	1	1	1	1	1
26	161-33	Rotor, Magnetic - Complete - F. M.	1	1	1	1	1
27	161-56	Shim, Thrust Bearing - F. M.	1	1	1	1	1
28	161-72	Bearing, Sleeve - Rotor - F. M.	1	1	1	1	1
29	161-60	Rotor, Distributor - Includes Contact Insert - F. M.	1	1	1	1	1
30	161-74	Pinion, Rotor - F. M.	1	1	1	1	1
31	161-49	Hub, Impulse Coupling - Includes Panel and Washer - F. M.	1	1	1	1	1
32	161-50	Coupling, Impulse - Includes Hub Drive Spring and Shell - F. M.	1	1	1	1	1
33	161-73	Bearing, Sleeve - Distributor - F. M.	1	1	1	1	1
34	12199	Magneto - Wico	1	1	1	1	1
35	162-40	Coupling Unit, Impulse - Wico	1	1	1	1	1
36	162-43	Lead Group - Ground - Wico	1	1	1	1	1
37	162-1	Gasket, Coll - Wico	1	1	1	1	1
38	162-18	Condenser Group - Wico	1	1	1	1	1
39	162-39	Arm Group - Wico	1	1	1	1	1
40	162-35	Cap Group - Wico	1	1	1	1	1
41	162-32	Housing Group, Gear - Wico	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
42	162-29	Pad, Cam Oil - Wico	1	1	1	1	1
43	162-62	Rotor Assembly - Wico	1	1	1	1	1
44	162-2	Coil Unit - Wico	1	1	1	1	1
45	162-5	Clamp, Coil Core - Wico	1	1	1	1	1
46	162-8	Plug, Oil - Wico	1	1	1	1	1
47	162-16	Gasket, Condenser Case - Wico	1	1	1	1	1
48	162-17	Contact, Fixed - Wico	1	1	1	1	1
49	162-24	Arm Group, Breaker - Wico	1	1	1	1	1
49A	162-136	Point Set, Breaker - Wico (Includes Nos. 48 and 49)	1	1	1	1	1
50	815-104	Screw, Fixed Contact - Wico (Replaces #162-19)	1	1	1	1	1
51	162-22	Washer, Breaker Point Spacing - Wico	1	1	1	1	1
52	162-23	Spacer, Breaker Arm - Wico	1	1	1	1	1
53	162-31	Clip Assembly, Distributor - Wico	1	1	1	1	1
54	162-38	Dust Washer, Distributor Arm - Wico	1	1	1	1	1
55	162-45	Cup, Drive - Wico	1	1	1	1	1
56	162-46	Spring, Drive - Wico	1	1	1	1	1
57	162-52	Arm, Trip - Wico	1	1	1	1	1
58	162-41	Gasket, Impulse Stop - Wico	1	1	1	1	1
59	162-65	Cover, Distributor Cap Shield - Wico	1	1	1	1	1
60	162-67	Bushing, Rotor - Wico	1	1	1	1	1
61	167A1167	Cable Assembly, Spark Plug - No. 2 - Used only with Wico Magneto	1	1	1	1	1
62	167A1184	Cable Assembly, Spark Plug - No. 1 - Used only with Wico Magneto	1	1	1	1	1
63	416A77	Cable, Battery - Negative and Positive	2				
64	416A4	Cable, Battery Jumper	1				
65	416-89	Hydrometer, Battery	1				
66	416-46	Battery - 12 Volt	3				
	161K3	Kit, Gasket and Washer - F.M.	1				

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
1	149B23	Line, Fuel - Pump to Carburetor - Used only with Marvel Schebler Carburetor	1	1	1	1	1
2	501A9	Line, Flexible Fuel	1	1	1	1	1
3	149A33	Line Assembly, Fuel - Pump to Carburetor - Used only with Zenith Carburetor	1	1	1	1	1
4	145A3	Pan Assembly, Carburetor Drip	1	1	1	1	1
5	12160D	Carburetor - Zenith	1	1	1	1	1
6	154A50	Gasket, Carburetor Flange - Zenith Carburetor	2	2	2	2	2
7	12169	Plate, Fuel Distribution	1	1	1	1	1
8	520A222	Stud, Carburetor Mounting	2	2	2	2	2
9	142-51	Carburetor - Marvel Schebler	1	1	1	1	1
10	154A24	Gasket, Carburetor Adapter Flange - Used only with Marvel Schebler Carburetor	1	1	1	1	1
11	142A3	Elbow, Carburetor Inlet - Used only with Marvel Schebler Carburetor	1	1	1	1	1
12	145A34	Gasket, Carburetor Adapter - Used only with Marvel Schebler Carburetor	1	1	1	1	1
13	149B663	Pump Assembly, Fuel (Replaces Pump #149C54)	1	1	1	1	1
14	149A126	Gasket, Fuel Pump Flange	1	1	1	1	1
15	149-156	Gasket, Filter Bowl - Fuel Pump	1	1	1	1	1
16	149-662	Bowl, Filter - Fuel Pump Metal (Replaces Glass Bowl #149-116)	1	1	1	1	1
17	748	Gasket, Primer Lever - Fuel Pump	1	1	1	1	1
18	747	Lever, Manual Primer - Fuel Pump	1	1	1	1	1
19	751	Screen, Filter - Fuel Pump	1	1	1	1	1
20	511	Follower, Eccentric - Fuel Pump	1	1	1	1	1
21	12046	Spring, Eccentric Follower	1	1	1	1	1
22	2019	Shaft, Eccentric Follower - Fuel Pump	1	1	1	1	1
23	502-53	Elbow, 45° - Fuel Pump	1	1	1	1	1
24	502-2	Elbow, Inverted Male - (1) Carburetor, (1) Fuel Pump	2	2	2	2	2
	149K134	Kit, Fuel Pump Repair	1	1	1	1	1
	142-50	Kit, Carburetor Repair - Marvel Schebler	1	1	1	1	1
	141K473	Kit, Carburetor Repair - Zenith (Replaces #141-25)	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

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REF.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. O - CHOKE GROUP							
1	153A113	Cover Assembly, Electric Choke - Includes Heating Element	1	1	1	1	1
1	153A115	Cover Assembly, Electric Choke - Includes Heating Element	1	1	1	1	1
2	153A86	Strap, Retainer - Thermostat Element	1	1	1	1	1
3	153A17	Element, Thermostat	1	1	1	1	1
4	153A58	Body, Choke	1	1	1	1	1
5	153A49	Cover Assembly, Electric Choke - Includes Heating Element	1	1	1	1	1
5	153A52	Cover Assembly, Electric Choke - Includes Heating Element	1	1	1	1	1
6	153A45	Bracket	1	1	1	1	1
7	153A53	Choke Assembly, Electric	1	1	1	1	1
7	153A55	Choke Assembly, Electric	1	1	1	1	1

FIG. P - CARBURETOR PARTS GROUP

1	815-116	Carburetor - Zenith <i>(1/4" 6.9 P.)</i>	1	1	1	1	1
2	141-12	Screw, Body Assembly (Replaces #141-6)	4	4	4	4	4
3	141-19	Needle, Main Jet Adjusting	1	1	1	1	1
4	815-116	Lever, Throttle Clamp	1	1	1	1	1
4	850-30	Screw, Throttle Lever Clamp (Replaces #141-6)	1	1	1	1	1
5	850-30	Washer, Lock - Bowl Assembly (Replaces #141-76)	1	1	1	1	1
6	141-101	Spacer, Throttle Lever	4	4	4	4	4
7	141-1	Lever, Throttle Stop	3	3	3	3	3
8	141-104	Cover, Fuel Bowl	1	1	1	1	1
9	141-13	Spring, Main Jet Adjusting Needle	1	1	1	1	1
10	141-2	Screw, Stop Lever Clamp	1	1	1	1	1
11	141-4	Spring, Throttle Stop Lever	1	1	1	1	1
14	141-77	Washer, Fuel Valve Seat Fibre	1	1	1	1	1
15	141-98	Shaft, Throttle	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

REF.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
16	815-110	Screw, Stop Lever (Replaces #141-3)	1	1	1	1	1
19	141-16	Valve and Seat, Fuel	1	1	1	1	1
22	141-72	Axle, Float	1	1	1	1	1
23	141-10	Float, Fuel Bowl	1	1	1	1	1
24	141-94	Gasket, Body to Bowl	1	1	1	1	1
26	141-92	Gasket, Cover to Bowl	1	1	1	1	1
27	810-41	Screw, Throttle Plate (Replaces #141-68)	2	2	2	2	2
28	141-69	Washer, Lock - Throttle Plate Screw	2	2	2	2	2
29	141-20	Plate - Throttle	1	1	1	1	1
30	141B525	Body, Throttle (Replaces #141-93)	1	1	1	1	1
31	141-120	Plate, Choke	1	1	1	1	1
32	141-21	Jet Main	1	1	1	1	1
33	141-144	Washer, Main Jet Fibre	1	1	1	1	1
34	141-99	Washer, Throttle Shaft Thrust	1	1	1	1	1
35	141-100	Pin, Thrust Washer Taper	1	1	1	1	1
36	141-69	Washer, Lock - Choke Plate	2	2	2	2	2
37	810-41	Screw, Choke Plate (Replaces #141-68)	2	2	2	2	2
38	141-9	Spring, Adjusting Screw	1	1	1	1	1
39	141-8	Screw, Idle Adjusting	1	1	1	1	1
40	141-105	Bowl, Fuel	2	2	2	2	2
41	801-8	Screw, Body to Bowl (Replaces #141-95)	2	2	2	2	2
42	850-40	Washer, Lock - Body to Bowl (Replaces #141-96)	1	1	1	1	1
43	141-85	Shaft, Air Shutter	2	2	2	2	2
44	141-70	Plug, Bowl Drain and Fuel Inlet	1	1	1	1	1
45	141-97	Washer, Metering Well Fibre	1	1	1	1	1
46	141-22	Well, Metering	1	1	1	1	1
47	141-11	Plug, Metering Well Passage	1	1	1	1	1
48	141-77	Washer, Metering Well Plug Fibre	1	1	1	1	1
49	141-103	Knob, Choke Shaft	1	1	1	1	1
50	141-100	Pin, Choke Knob Taper	1	1	1	1	1
142-51		Carburetor - Marvel Schebler	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

FIG. P - CARBURETOR PARTS GROUP (Cont.)

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
51	815-103	Screw, Bowl Cover (Replaces #142-29)	3	3	3	3	3
52	815-91	Screw, Choke Fly (Replaces #142-28)	2	2	2	2	2
53	142-37	Fly, Choke	1	1	1	1	1
54	142-39	Shaft, Float	1	1	1	1	1
55	142-48	Sleeve Assembly, Choker	1	1	1	1	1
56	142-183	Shaft Assembly	1	1	1	1	1
57	142-31	Gasket, Body to Bowl	1	1	1	1	1
58	148A17	Gasket, Float Valve Seat or Main Adjusting Valve Assembly, Matched Float - Includes Gasket	2	2	2	2	2
59	142-49	Gasket, Nozzle	1	1	1	1	1
60	142-32	Nozzle Assembly (Replaces #142-289)	1	1	1	1	1
61	142-285	Nut and Jet	1	1	1	1	1
62	142-290	Float and Lever Assembly	1	1	1	1	1
63	142-38	Body Assembly, Not Sold Separately - Order 142-51 Carburetor Assembly	1	1	1	1	1
64	142-23	Needle, Idle	1	1	1	1	1
65	142-40	Spring, Idle Needle (Replaces #142-34)	1	1	1	1	1
66	142-282	Spring, Throttle Lever Adjusting Screw	1	1	1	1	1
67	142-35	Screw, Throttle Stop Adjusting (Replaces #142-27)	1	1	1	1	1
68	815-106	Shaft Assembly, Throttle	1	1	1	1	1
69	142-24	Retainer, Main Adjusting Needle	1	1	1	1	1
70	142-46	Retainer, Main Adjusting Needle Packing	1	1	1	1	1
71	142-45	Screw, Throttle Fly	2	2	2	2	2
72	142-26	Needle Assembly, Idle	1	1	1	1	1
73	142-41	Packing, Main Adjusting Needle	1	1	1	1	1
74	142-206	Needle Assembly, Main Adjusting - Includes Pack Nut and Retainer	1	1	1	1	1
75	142-42	Fly, Throttle	1	1	1	1	1
76	142-25	Kit, Gasket - Marvel Schebler Carburetor	1	1	1	1	1
77	142A3	Kit, Gasket - Zenith Carburetor Elbow, Carburetor Mounting	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. Q - GENERATOR GROUP							
1	12802	Bolt, Generator Frame Mounting.....	4	4	4	4	4
2	222-1612	Coil Assembly, Field (Replaces 222A1022).....	1	1	1	1	1
2	222A1131	Coil Assembly, Field	1	1	1	1	1
2	222A1189	Coil Assembly, Field	1	1	1	1	1
2	222A1093	Coil Assembly, Field	1	1	1	1	1
3	222A1190	Coil Assembly, Interpole	4	4	4	4	4
4	221A4	Shoe Assembly, Pole	4	4	4	4	4
4	221B2	Shoe Assembly, Pole	4	4	4	4	4
5	210-1802	Frame Assembly, Generator - Includes Frame, Poleshoe and Coils (Replaces 210A1028)	1	1	1	1	1
5	210A1142	Frame Assembly, Generator - Includes Frame, Poleshoe and Coils	1	1	1	1	1
5	210A1219	Frame Assembly, Generator - Includes Frame, Poleshoe and Coils	1	1	1	1	1
5	210A1070	Frame Assembly, Generator - Includes Frame, Poleshoe and Coils	1	1	1	1	1
6	201A96	Armature Assembly	1	1	1	1	1
6	201A196	Armature Assembly	1	1	1	1	1
6	201A165	Armature Assembly	1	1	1	1	1
6	201A100	Armature Assembly	1	1	1	1	1
7	520A301	Stud, Armature Through	1	1	1	1	1
7	520A121	Stud, Armature Through	1	1	1	1	1
8	212B288	Rig Assembly, Brush - Includes Brush Springs and Brushes (Replaces 212B83)	1	1	1	1	1
8	212B88	Rig Assembly, Brush - Includes Brush Springs and Brushes	1	1	1	1	1
8	212C28	Rig Assembly, Brush - Includes Brush Springs and Brushes	1	1	1	1	1
8	212C69	Rig Assembly, Brush - Includes Brush Springs and Brushes	1	1	1	1	1
9	211C8	Bell, End	1	1	1	1	1
10	232A316	Clip, Bearing Stop	1	1	1	1	1
11	232A1	Gasket, Bearing Plate	1	1	1	1	1
12	232A518	Cover, Bearing Support (Replaces #232B2)	1	1	1	1	1
13	232B42	Band, Cover - Air Intake	1	1	1	1	1
14	232A94	Washer, Generator Frame Mounting	4	4	4	4	4
15	232A274	Stud, Generator Frame - Hook Style - Bearing Support Mounting	2	2	2	2	2
15	232A252	Stud, Generator Frame - Hook Style - Bearing Support Mounting	2	2	2	2	2

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

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P.E.W. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. Q - GENERATOR GROUP (Cont.)							
16	510A1	Bearing, Armature Shaft Ball (Replaces #510A16)	1	1	1	1	1
17	212A1003	Spring, DC Brush - Prior to Spec "H"	1	1	1	1	1
17	212B1105	Spring, DC Brush - Begin Spec "H"	4	4	4	4	4
17	212A1003	Spring, DC Brush	4	4	4	4	4
17	212A1011	Spring, DC Brush	4	4	4	4	4
18	214A30	Brush, DC - Prior to Spec "H"	4	4	4	4	4
18	214A61	Brush, DC - Begin Spec "H"	4	4	4	4	4
18	214A9	Brush, DC	4	4	4	4	4
18	214A18	Brush, DC	4	4	4	4	4
18	214A12	Brush, DC	4	4	4	4	4
19	312A27	Condenser - 0.5 Mfd.	1	1	1	1	1
20	312A58	Condenser - 0.1 Mfd. (Replaces 312A15)	1	1	1	1	1
21	212A1008	Spider, Brush Rig	1	1	1	1	1
22	212A1004	Spring, AC Brush - Prior to Spec "H"	4	4	4	4	4
22	212B1105	Spring, AC Brush - Begin Spec "H"	4	4	4	4	4
23	214A27	Brush, AC - Prior to Spec "H"	4	4	4	4	4
23	214A46	Brush, AC - Begin Spec "H"	4	4	4	4	4
23	214A27	Brush, AC	4	4	4	4	4
24	1260	Bell, End	1	1	1	1	1
25	232A255	Gasket, Bearing Plate	1	1	1	1	1
26	1266	Plate, Bearing	1	1	1	1	1
27	1265	Cover, Bearing Support	1	1	1	1	1
28	516A23	Pin, Dowel - Generator Frame	1	1	1	1	1
29	526A50	Washer, Armature Through Stud	1	1	1	1	1
FIG. R - CONTROL GROUP							
1	12803	Cover, Control Box	1	1	1	1	1
2	304-121	Resistor, Fixed - 10 Ohm - 10 Watt	1	1	1	1	1
3	332-185	Terminal, Fahnstock - #3-8-32" Hole	1	1	1	1	1
4	332-186	Terminal, Fahnstock - B -	1	1	1	1	1
5	307-81	Relay, Ignition	1	1	1	1	1
6	304A113	Resistor, Current Limiting (Replaces #304A123)	1	1	1	1	1

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
7	301B467	Panel, Control Box Front	1	1	1	1	1
8	302-58	Ammeter	1	1	1	1	1
9	307B180	Relay, Reverse Current	1	1	1	1	1
10	304-120	Resistor, Fixed - 2 Ohm, 25 Watt	1	1	1	1	1
11	308-7	Switch, Hi-Lo Charge	1	1	1	1	1
12	332-184	Terminal, Fahnestock - #2-8-32" Hole	1	1	1	1	1
13	332A222	Block, Terminal	1	1	1	1	1
14	307-40	Solenoid, Start	1	1	1	1	1
15	301C449	Panel, Control	1	1	1	1	1
16	301B1295	Panel, Control Box Side (Replaces 301B21)	1	1	1	1	1
16	301B467	Panel, Control Box Side (Replaces 301B20)	1	1	1	1	1
17	332A237	Strip, Marker	1	1	1	1	1
18	332A231	Block, Terminal	1	1	1	1	1
19	308-5	Switch, Ignition (Replaces #308-6)	1	1	1	1	1
20	312A58	Condenser - 0.1 Mfd. (Replaces 312A15)	1	1	1	1	1
21	12800	Base, Control Unit	1	1	1	1	1
22	12804	Clamp, Control Base	1	1	1	1	1
23	331-17	Nipple, Chase - 1/2"	1	1	1	1	1
24	332A97	Stud, Threaded Terminal	1	1	1	1	1
25	313A16	Spacer, Start-Stop Switch Panel	2	2	2	2	2
26	8743A	Switch Assembly, Start-Stop	1	1	1	1	1
27	508-8	Grommet, Rubber	1	1	1	1	1
28	304-33	Resistor - 1.5 Ohm, 50 Watt - 3/4" x 4"	1	1	1	1	1
29	304-18	Resistor - .17 Ohm, 160 Watt - 3/4" x 6"	1	1	1	1	1
30	304A29	Stud, Resistor Mounting	2	2	2	2	2
31	79528	Box, Resistor	1	1	1	1	1
32	301B193	Panel, Control Box Side	1	1	1	1	1
33	302-61	Ammeter	1	1	1	1	1
34	75105A	Coil, Choke	1	1	1	1	1
35	12824	Relay, Charge	1	1	1	1	1

FIG. R - CONTROL GROUP (Cont.)

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

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REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
96	332A252	Switch, Hi-Lo Charge	1	1	1	1	1
97	312A58	Bracket, Terminal	1	2	1	1	1
38	312A58	Condenser - 0.1 Mfd. (Replaces 312A15)	1	1	1	1	1
39	307-61	Solenoid, Start	1	1	1	1	1
40	12795	Panel, Control	1	1	1	1	1
41	508-9	Grommet, Rubber	1	1	1	1	1
42	13520	Panel, Control Box Side	1	1	1	1	1
43	307A30	Bracket, Solenoid Mounting	1	1	1	1	1
44	332-183	Terminal, Fahnestock - #1-8-32" Hole	1	1	1	1	1
45	302-57	Anmeter	1	1	1	1	1
46	301B307	Panel, Control	1	1	1	1	1
47	77204	Relay Assembly, Charge	1	1	1	1	1
48	304-78	Resistor - 25 Ohm, 50 Watt	1	1	1	1	1
49	304-79	Resistor - 100 Ohm, 50 Watt	1	1	1	1	1
50	332-167	Post, Terminal - Battery Positive	1	1	1	1	1
51	332-168	Post, Terminal - Battery Negative	1	1	1	1	1
52	332-168	Post, Terminal - Battery Negative	1	1	1	1	1
53	332-165	Post, Terminal - Battery Positive	1	1	1	1	1
54	508-2	Grommet, Rubber	1	1	1	1	1
55	301B214	Panel, Control	1	1	1	1	1
56	302A74	Bracket, Ammeter Shunt Mounting	1	1	1	1	1
57	301C289	Box, Control - Only	1	1	1	1	1
58	12794B	Cover, Control Box	1	1	1	1	1
59	302-207	Ammeter (Replaces #302-37)	1	1	1	1	1
60	308-29	Switch, Stop	1	1	1	1	1
61	302B71	Shunt, Ammeter	1	1	1	1	1
62	308-28	Switch, Start	1	1	1	1	1
63	304-3	Resistor, Fixed - 50 Ohm	1	1	1	1	1
64	332A23	Adapter	1	1	1	1	1
65	332AA1	Block, Insulating	1	1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANTITY USED				
			A	B	C	D	E
FIG. R - CONTROL GROUP (Cont.)							
66	307-87	Relay - 125 Amp		1			
67	304-15	Washer, Resistor		1			
68	508-9	Grommet, Rubber		1			
69	312A17	Condenser - 0.5 Mfd		1			
70	308-6	Switch, Toggle		1			
71	301C290	Support, Control Box		1			
72	304-122	Resistor, Adjusting - 25 Ohm		1			
73	304-58	Resistor, Adjusting - 50 Ohm, 50 Watt		1			
SERVICE KITS							
168K28		Kit. Engine Gasket		1	1	1	
120K162		Kit, Oil Pump Gasket		1	1	1	1
142-33		Kit, Gasket - Marvel Schebler Carburetor		1	1	1	1
141-17		Kit, Gasket - Zenith Carburetor		1	1	1	1
141-25		Kit, Carburetor Repair - Zenith		1	1	1	1
142-50		Kit, Carburetor Repair - Marvel Schebler		1	1	1	1

WHEN ORDERING PARTS BE SURE TO INCLUDE MODEL, SERIAL NO., AND SPEC. NO. OF UNIT!